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Immunological responses to stress: The effects of action and state orientation

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Immunological Responses to Stress:

The Effects of Action and State Orientation

by

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This study presents some evidence that state/action orientation describes an individual differences dimension which moderates health outcomes. Three hundred forty-five college students were screened for state/action orientation using the Action Control Scale questionnaire (Kuhl, 1981,1985,1986,1992a,1992b). Seventy-five students with extreme state orientation scores (state-oriented) or extreme action orientation scores (action-oriented) were given questionnaires assessing physical health and life stress. State-oriented students reported more physical symptoms that reflect the typical health problems of college students than did action-oriented students. In addition, the blood cortisol levels of these 75 students were assessed before and after exposure to 30 minutes of activity designed to create a moderate level of stress. There was no significant difference in changes in cortisol levels between the state-oriented and action-oriented groups; however, including gender as a factor resulted in a significant 3 factor interaction (stress x gender x cortisol). In the stress condition males had significantly greater increases in cortisol than females, but in the no-stress condition males had significantly greater decreases in cortisol than did the females. There was also a trend for action-oriented females to respond in a pattern more similar to action- and state-oriented males than to state-oriented females in the production of cortisol after stress.

In part 2 of this study 55 subjects, 55 to 95 years of age, were given questionnaires assessing state/action orientation and physical health. State-oriented subjects were found to have more physical health problems than action oriented subjects in this age group as well.

Future research is suggested by the post-hoc analysis of recruitment problems in both subject pools. Action-oriented subjects in both populations were more likely than state-oriented subjects to agree to participate and to follow through after agreeing to participate in the studies. The concept of state and action orientation as a variable in physical health, and as a predictor of participation in promoted activities is discussed as well as gender and state/action orientation differences in cortisol responses.

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INTRODUCTION

There is growing body of evidence that emotional stress may affect immune status (Ader, Cohen, & Felten, 1991; Miller, 1980; Schedlowski et al., 1993). Major life events such as divorce, death of a loved one, birth of a first child, or loss of a job are related to a wide variety of physical and mental illnesses (Dohrenwend & Dohrenwend, 1974, 1978, 1981; Hinkle, 1974). The accumulation of minor hassles is also associated with physical and mental health problems (Dohrenwend, Dohrenwend, Dodson, & Shrout, 1984; Silver & Wortman, 1980). A significant relationship between daily stress and the occurrence of both concurrent and subsequent health problems such as flu, sore throat, headaches, and backaches was found by DeLongis, Folkman, and Lazarus (1988). Furthermore, Weinberger, Hiner, and Tierney (1987) found evidence to support the claim that (a) frequently occurring minor stressors (hassles) were better predictors of health status than major life change events, and (b) the influence of life change events is indirect, i.e., they increase hassles, which in turn, negatively affect health status.

Stress has been implicated as an important contributing factor to many physical dysfunctions. There is now growing interest in the physiological changes involved in this process. Biochemical changes in immune cells have been measured in subjects who have experienced the death of a loved one (Irwin, Daniels, Smith, Bloom, & Weiner, 1990). Intermittent situation stressors such as college examinations have been shown to change biochemical measures of immune function (Kiecolt-Glaser et. al, 1984).

The observed relationship between stressful life events and adverse health changes has tended, on the average, to be small (Rabkin & Struening, 1976), apparently due to large individual differences. In other words some people are more susceptible than others to the adverse consequences of stress. Circumstances that adversely affect the health of some people seem to leave others unaffected (Linville, 1983). Individual differences in health outcomes have led researchers to suggest variables which moderate these outcomes differentially. The variable most often cited as a moderator of these individual differences in health outcomes is the availability of social support (for reviews, see Broadhead et al., 1983; Cohen & Syme, 1985; Gottlieb, 1987; Sauer & Coward, 1985). Other variables which have been shown to moderate health outcomes include hardiness (Kobasa, 1979), self-discrepancy (Strauman, Lemieux, & Coe, 1993), self-efficacy (Wiedenfeld, et al., 1990), self esteem (Brown & McGill, 1989), and perception of control (Alexander, Langer, Newman, Chandler, Davies, 1989; Langer, 1983; Langer & Rodin, 1976; Rodin & Langer, 1977).

The definitive variable which has the most impact on individual differences in health outcomes, or the latent variable which connects all of these concepts, has been elusive to this point. An intriguing evolution of one of these concepts which suggests further research can be seen in the literature on the perception of control. An impressive finding concerning health outcomes comes from field experiments carried out by Judith Rodin and Ellen Langer in nursing homes for the elderly (Langer & Rodin, 1976; Rodin & Langer, 1977). These studies showed significant mental and physical improvements brought about by giving elderly people in restricted institutional environments a sense of being at least

partially in charge of their own lives by allowing them to take an active role in choosing some of their daily activities. The results of these field studies have led Langer into a great deal of research on the causes and consequences of perceived control.

In examining issues of successful functioning in the institutionalized elderly, Langer, Rodin, Beck, Weinman, and Spitzer (1979) studied age-related intellectual and cognitive decline. Residents of a nursing home were told that they were going to be asked several questions during each visit and that they would receive one poker chip for each correct response. The researcher explained that at the end of three weeks they would be able to redeem the chips for a gift and that the more chips they had the better the gift would be. Those residents for whom outcomes were contingent upon memory showed cognitive improvement relative to those residents to whom the same amount of attention was given without contingent rewards for cognitive activity. In the first group, short-term memory was improved, as evidenced by performance on a probe recall test; memory for recent events was improved, as evidenced by better recall of meals and activities; and there was greater speed in finding and reporting information about the subject's own environment. In a follow-up investigation of this study, the results were striking (Langer, 1983). Seven percent of the contingent group had died, compared to 33 percent of the noncontingent and 27 percent of the no-treatment group. Langer concluded that the subjects in the contingent group were more involved with their environment than those in the comparison groups.

In summary, these field studies showed that actively involving subjects in choosing some of their daily activities and incorporating outcomes contingent upon their cognitive

activity led to similar improvements in health outcome. These results led Langer to consider a broader conceptualization of the perception of control than she had focused on in her earlier studies. The manipulation of choice in daily activities and rewards for cognitive activity resulted in less automatic functioning and more thoughtful processing of environmental stimuli. Langer described these deeper, more thoughtful interactions as mindful processing or mindfulness.

Langer, Blank, and Chanowitz (1978) conducted field experiments to test the hypothesis that complex social behavior may be performed without conscious attention to relevant semantics, or in other words mindlessly (not mindfully). The predictions were confirmed that when the structure of a communication, be it oral or written, followed a pattern consistent with the subject's past, the subject would react without attending to relevant details of the request. The authors drew the distinction between mindful and mindless cognitive activity. When mindful, it was hypothesized that the individual was actively drawing distinctions, making meaning, or creating categories. When mindless, the individual was said to rely on distinctions already drawn. Mindless behavior is rigidly dictated by past experiences of the perceiver, and much of the on-going present situation is left unexamined. Furthermore, mindless activity does not imply the absence of all cognitive processing - just the absence of flexible cognitive processing (Langer, Chanowitz & Blank, 1985).

Langer (1983) summarized her work up to 1983 with this comment:

> . . we have seen the emergence of a new understanding of perceived control. This mindful process of mastering one's environment has intrigued me during the decade

> in which the research reported here was conducted. In studying the findings of this research, I have been struck by the apparent relationship between the individuals' involvement in whatever task we placed before them and the degree to which they seemed to improve both psychologically and physically. The process of mindful involvement is control. And control in this form is consistently potent. (p. 293)

There is some evidence for the deleterious effects of excessive mindless functioning on behavior and for a positive, adaptive influence of mindfulness (Langer 1982, 1989; Langer & Piper, 1987). Alexander et al. (1989), found that a 12-week treatment period, 20 minutes twice daily, of a structured word-production task and an unstructured creative mental activity task, significantly increased the survival rate of a group of elderly people compared to treatments of relaxation training only.

Langer's original research showed improved health and decreased mortality after experimentally manipulating the environment to produce increased perceptions of control (Langer & Rodin, 1976; Rodin & Langer, 1977). Her more recent work has involved experimentally inducing the state of mindfulness with results in improved health and decreased mortality (Alexander et al., 1989). In other words, the concept of changing the environment to encourage new perception has evolved into changing the subject's mind state to interact with the environment in a new way. This is an important distinction. The concept of changing the environment to encourage new perception suggests that policies of institutions, such as nursing homes, can have effects on health outcomes (i.e., allowing more choices in daily activities can result in positive health outcomes). However, the concept of the mind state of the individual causing differential interactions with the

environment, and this resulting in differential health outcomes, suggests two new dimensions in interventions aimed at improving health. The first involves the identification of individuals or groups of individuals at risk for negative health outcomes and the second suggests interventions aimed at improving health. In other words, an individual with a dispositional tendency for mindlessness, or predominantly in an environment which has trained the individual to react in a mindless manner when encountering all situations, would be at risk for negative health outcomes. It also follows that interventions aimed at training individuals in mindful functioning would increase positive health outcomes.

Janis (1983) describes the progression of Langer's work in this way:

> Langer presents a framework that emphasizes the gains to be expected from shifting people from a passive state of mindlessness to an active state of mindfulness, which may be essential for vigilantly seeking out new information, weighing alternatives, and selecting appropriate courses of action that take account of the full range of potential consequences. In Langer's analysis, perceived control is a key mediating variable leading to this adaptive transformation, which links up her research on aiding apparently helpless people to improve their lot with the broader area of effective decision making among all sorts of people, including those who function best. (p. 11)

A cognitive distinction induced by manipulations similar to Langer's experimental manipulations of mindfulness/mindlessness has been described by Kuhl (1981, 1985, 1986, 1992a, 1992b). Kuhl's work involves experimental manipulations similar to those used in Langer's work, but includes a more elaborate and precise description of the cognitive distinctions, the proximal and distal precursors of these distinctions and empirical data for

support. Kuhl's work, however, does not include the measures of physical health outcomes and mortality which Langer's does. Because Kuhl's theory is so comprehensive and similarities to Langer's experimental manipulations suggest it has the potential to predict individual differences in physical health outcomes. I will turn to a description of this work.

Kuhl's theory distinguishes two frames of mind, referred to as "state" and "action" orientations. These frames of mind can change from moment to moment depending on the situation, but there are also individual differences in the tendency to engage in one orientation or the other. An individual is said to be action-oriented if attention is focused on an action or plan of action. If attention is focused on some internal or external state, the individual is said to be state-oriented. This state may be characterized by persevering cognitions related to some present, past, or future state of the individual, or even by the absence of any coherent conscious thought (e.g. absent-mindedness).

In Kuhl's work, action orientations are focused primarily on the formation of goals and the formation and execution of plans of action relevant to goals. State orientations, on the other hand, are analytic and reflective in nature. In state orientations, attention is focused on an analysis of one's current situation, including one's current psychological state. Kuhl suggests, for instance, that if after dropping a valuable vase a person keeps staring at it or continues questioning how that could ever have happened, he or she may have considerable difficulty enacting any change-oriented intentions, such as picking up the pieces, trying to glue them together, or initiating some new activity unrelated to the event. As long as an individual is in a state-oriented mode of control, the enactment of

action-oriented intentions seems to be more difficult than when the individual is in a action-oriented mode of control. Kuhl (1992b) describes action orientation as:

> . . . a specific category of processes that mediate the implementation and maintenance of self-chosen, goal-directed activities. These self-regulatory processes are activated whenever automatic responding is interrupted, unsuccessful, or appears too risky in light of the subjective cost of a possible failure. (p.103)

Several experimental methods for inducing action or state orientation have been developed. State orientation has been situationally induced by asking subjects to respond to a questionnaire consisting of state-related questions concerning causal attribution for their failure experiences, description and evaluation of their own emotional state, and description and evaluation of the experimental setting (Kuhl, 1981). When subjects were instructed to engage in these state-oriented behaviors after having been exposed to failure, performance deficits on a subsequent concentration task were accentuated. In the same experiment, action orientation was induced by asking the subjects to read an essay and to make a personal judgment about how interesting, informative, and well written it was. The subjects in the action orientation group did not show performance deficits on a concentration task after having been exposed to uncontrollable failure. It is interesting to note here that Kuhl's induction of action orientation in this study is similar to the word-production task and creative mental activity task described above that Alexander et al. (1989) used to induce what they describe as mindfulness.

The induced differences in performance deficits after a failure paradigm, as described above, led to several experiments testing a state/action orientation theoretical explanation

of generalized performance deficits after failure. It was found that subjects could be completely immunized against the debilitating effect of exposure to uncontrollable failure by instructing subjects to verbalize their hypothesis about the correct solution while working on the problem. It was theorized that in this condition subjects were induced to action orientation. This result is consistent with the theory that the deficits observed after uncontrollable failure occur because of interfering state-related cognitions.

The preoccupation with state-related cognitions may not be the only way in which cognitive capacity is occupied for state-oriented subjects. State-oriented subjects have been shown to focus on irrelevant material more than action-oriented subjects (Kuhl, 1985). Subjects were shown a set of seven cards each of which had three words set in a square and three words set in a circle. Subjects were asked to memorize the words in the square, thus rendering the words in the circle as "irrelevant". After inspecting each card for fifteen seconds, the subjects were shown a list of 100 words and asked to select the words they recognized, regardless of whether they had seen them in a square or a circle. The results showed that state-oriented subjects recognized significantly more irrelevant words than action-oriented subjects.

The study of selective attention described above also introduces an important point in Kuhl's description of state versus action orientation. Kuhl (1992a) emphasizes that state orientation in itself is not a psychological disorder. Although there are negative implications of state orientations, there are also instances where state-oriented individuals would have an advantage. For example, in the selective attention task described above, the unexpected request for irrelevant material resulted in a higher success rate for state-oriented individuals than action-oriented individuals. Kuhl depicts a similar argument for

tasks requiring deliberate decision-making rather than fast and flexible action. In a team, state-oriented individuals may play an important role in decision-making, especially when wrong decisions are associated with high risks, whereas action-oriented individuals would be better at implementing decisions. The negative adaptiveness of state-oriented individuals can be described in many aspects of successful functioning, but situations can be described which favor state orientation.

Kuhl's theory specifies proximal antecedents of state orientation, the presence of which can be manipulated experimentally, such as: unrealistic intentions, loss of control, fear of failure, false self-attribution of others' expectations, negative mood, over-motivation, extrinsic motivation, interruption, time pressure, boredom, and monotony. Each of these situations increases the chance of a competing mental activity that is not compatible with the self-chosen intentions guiding the individual's activities (Kuhl, 1992b).

Kuhl (1985) describes an experimental test of his theory regarding more distal determinants of action and state orientations. In order to assess individual differences in the probability of becoming action or state oriented, he developed an Action Control Scale questionnaire which has had encouraging psychometric analyses (Kuhl, 1984) and has recently been revised (J. Kuhl, personal communication, December 1, 1993). Each question has two alternative answers, one indicating action orientation and the other indicating state orientation. This questionnaire is scored by summing the total number of action orientation responses. The scores represent a continuum with state orientation at the low end of the scale and action orientation on the high end.

This line of research has led to the specification of some distal antecedents defining developmental precursors of dispositional state orientations. These distal precursors are: parental orientations towards over-achievement, excessive emphasis on obedience, chronic frustration of basic needs, traumatic experiences, and under-stimulation. These socialization conditions make it harder for a child to develop a clear concept of a conflict-free, autonomous individual self who can distinguish between one's own and other people's beliefs, desires, expectations, and intentions.

Kuhl (1992b) admits that his theory does not contain any assumption excluding the possibility that a given individual's measured disposition can be superseded by situational determinants or changed by training, although he does assume that people may differ substantially with regard to the strength, generality, and stability of this disposition.

The concepts of state/action orientation and mindfulness/mindlessness are both distinguished in similar situations and yet they have driven research in different directions. Langer's mindfulness/mindless distinction has been used to examine effects on physical health and mortality. Kuhl's state/action orientation distinctions have been used to: describe the maintenance of depressive mood states in chronic depressive patients as state-oriented preoccupations of unfulfilled intentions (Kuhl & Helle, 1986), induce individual differences in performance deficits in learned helplessness paradigms (Kuhl, 1981), predict which individuals are susceptible to depression (Rholes, Michas, & Shroff, 1989), and induce individual differences in mastery of a stimulus-reaction task (Schwetlinghaus, Kiesswetter, Schmidt, & Rutenfranz, 1989). The effects of state versus action orientation on measures of physical health have not been examined. The similarity of Kuhl's

experimental methods of inducing action orientation, described above, to manipulations of mindfulness and resultant effects on health and mortality (Alexander et al., 1989) suggests that action orientation could also have effects on physical health and mortality.

A possible mechanism creating different health outcomes in state- versus action-oriented individuals is suggested in the literature on coping responses to stress. Two distinct coping responses to stress have been documented by physiological and behavioral data (Antoni, 1987). These coping responses are known as active coping and passive reaction. Wiedenfeld et al. (1990) describe these two systems as the "effort" and "distress" systems.

The effort system, or active coping, is engaged primarily during fear and anger. This system acts as an adaptive response to prepare the individual for "fight or flight" from the stressor. On the other hand the distress system, or passive reaction is thought to reflect the perception that the threat is overwhelming. For this reason the passive reaction is also called helplessness.

The physiological pathways of these two systems involve different endocrine or hormonal responses. The active coping response involves the sympathetic-adrenomedullary pathway which results in the release of catecholamines (norepinephrine and epinephrine). These catecholamines allow for cardiac output to increase to meet heightened metabolic needs (e.g. increased blood flow to skeletal muscle).

The passive coping response, also termed hypervigilance and conservation withdrawal, is primarily under the control of the hypothalamic-pituitary-adrenocortical pathway which results in the release of corticosteroids (cortisol). Thus, the passive,

(helplessness, distress, hypervigilance, conservation withdrawal) system results in elevations in cortisol. Elevations in cortisol are seen in highly stressful situations in which active coping responses do not seem readily available (Antoni, 1987). Corticosteroid elevation is involved with the suppression of the immune system (Antoni, 1987; Stern, 1988; Strauman at al., 1993; Wiedenfeld et al., 1990). Reichlin (1993) reviews evidence which suggests that virtually all the components of the immune response are inhibited by cortisol.

Because individuals who have developed a disposition to enter state orientation across a variety of events have been shown to focus on emotional states and irrelevant material, their coping responses appear to be passive distress responses instead of active coping responses. This suggests that these individuals would respond to stressors by activating the passive response system which is the hypothalamic-pituitary-adrenocortical pathway (cortisol production) more often than individuals who have developed a disposition to enter action orientation across a variety of events. This would predict that individuals who score low on Kuhl's Action Control Scale (ie. are state-oriented), would have more elevations of cortisol after a stressor than individuals measuring high on the action control scale.

It is unknown whether one situation of elevated cortisol would result in a negative health outcome. However, because cortisol inhibits the immune system, individuals who respond to stress over a variety of situations with an increase in cortisol production may have more negative health outcomes than individuals without this response to stress.

If identification of an individual's personality as state-oriented predicts negative health outcomes, the applications would involve two areas. First, identification of individuals at risk would allow for closer monitoring of symptoms and prompter medical response. Second, since Kuhl's theory includes the postulation of proximal and distal antecedents, it suggests interventions aimed at affecting these antecedents and thus reducing the risk for negative health outcomes could be developed. For instance, boredom and monotony in nursing homes would be viewed as health risks that could result in expensive medical treatment.

Experiment 1 of the study reported here compared the cortisol levels, after exposure to stressors, of individuals who score low on the Action Control Scale (i.e., are state-oriented) with individuals who score high in Action Control Scale (i.e., are action-oriented). The second part of the study reported here used a prospective design to examine the relation between accumulated life stresses and subsequent physical symptoms in a population over 55 years of age. Linville (1987) found effects of stress on physical health in such a prospective design in a population of college students. Experiment 2 of the study reported here measured the effect of naturally occurring stressors on clinical consequences in a vulnerable population as a function of state and action orientations. Thus both an experimental manipulation and a prospective correlational analysis will be used to assess the validity of state and action orientation disposition measurements as predictors of health outcomes.

EXPERIMENT 1

Method

Subjects

Three hundred forty-five University of Montana students, who were enrolled in an introductory psychology class, were screened for this study. Seventy-five of these students were asked and agreed to participate in the experiment. These participants received research credits toward their course requirement for their involvement as subjects.

Procedure

An Action Control Scale (ACS-90) questionnaire was given to 345 students, 148 males and 197 females, in the introductory psychology course at the University of Montana. Students with extreme scores, the highest (action-oriented) and the lowest scores (state-oriented), were invited to participate in the study until a sufficient number had agreed to participate. Some students who missed appointments agreed to rescheduled. The final sample consisted of 38 action-oriented subjects and 37 state-oriented subjects. Twenty-six of these action-oriented subjects and 24 of the state-oriented subjects were placed randomly into the stress condition group. The remaining 25 subjects (12 from the action-oriented group and 13 from the state-oriented group) were placed in the control (no-stress) condition.

All 75 subjects were tested between 3:00pm and 5:15pm to control for diurnal variation of cortisol levels. Plasma cortisol concentrations are at their highest levels and increasing from 4am until 8am. Cortisol concentrations fall from 8am until 9pm and

remain relatively constant from 9pm until 4am. Normal levels have been established for cortisol concentrations at 4pm (MetWest Clinical Laboratories, 1995). All subjects were tested in the same two week period, between February 22 and March 7, 1994 to control for variations of semester course-work stress.

Six undergraduate students at the University of Montana, three females and three males, served as experimenters. I contacted subjects by phone to request their participation in an experiment that involved having their blood drawn. If the subjects still agreed to participate, they were asked to schedule a one hour block (beginning at 3:00pm or 4:00pm) Monday through Friday. Subjects were told when they scheduled that they might be assigned to a group in which they had time to study or relax between tests and that they might wish to bring something to read or study. The University of Montana Student Health Service was used for the experiment to insure the subjects' confidence in the blood drawing procedure.

As soon as the subjects arrived at the Health Service waiting room at the appointed time, they were met by an experimenter and asked to complete a form asking their name, date of birth, weight, height, and psychology class instructor. They were also asked to sign a consent form which explained that they would be required to complete various tasks, problem solving tests and health questionnaires, and to have their blood drawn. (see Appendix A).

Because of a concern for differences in the baseline stress level of the subjects, each subject was then given a cassette in a cassette recorder with headphones and told to sit down in the waiting room and listen to the recording. The recording began with a woman's voice explaining:

"You have found the right building and the right room. You have signed in and now you need not worry about your experimental credit or about getting out of here on time. This study will take one hour. Because some of you had to rush here across campus from another class or from other appointments or obligations, we would like to use this means to get each of you relax and come into this study in the same frame of mind. For this purpose we are asking you to listen to a five minute relaxation exercise. You need not close your eyes or do anything more than just listen, but please do try to relax as you listen to this brief exercise. This is not a test and nothing will be expected of you in response to this exercise. It is simply a means of getting you unwound from a hectic day or focusing you for this study. We appreciate the fact that you have volunteered to help us and are glad to share our work with you."

This was followed by a male voice beginning with the suggestion "try to think of nothing else but your body, your muscles, nothing else. Focus on your right hand." The exercise proceeded with the same voice slowly suggesting the subject focus progressively, on the hands, arms, face, neck, skin, forehead. As each area was mentioned the subject was asked to relax that part of the body as the speaker suggested that the area was becoming heavy and warm and that tension was draining out. The next voice heard was a different male voice calmly stating,

"Ok, there is not time in a brief five minute exercise to become deeply relaxed. Hopefully, at least you do not feel rushed or hassled. You can now turn off the

recorder, remove the ear phones and place them beside you. Someone will come and get you when it is time to begin."

When the subjects were seen to take the ear phones off, one of the six experimenters took the subjects, individually, to a room designated for blood drawing, where the blood sample was immediately taken. After the blood sample was drawn, the subjects were taken to another room where the experimenter assigned to them was already seated, and the experiment was started. There was one experimenter for each subject. The subjects in the stress condition completed the experimental - stress condition tasks during a time period of 30 to 35 minutes, and the subjects in the control group were asked to read magazines or study and wait for the other subjects to complete their portion of the experiment (see Appendix B for the directions given for each condition). The experimenters assigned to subjects in the control condition left the room during this waiting period. Immediately after the stress condition tasks for the experimental subjects and after the 30-minute resting condition for the control subjects, each subject was escorted individually to the same room used for the blood drawing the first time, and a second blood sample was drawn.

Subjects were then escorted back to their previous room, where they completed the measures described below assessing their physical symptoms, recent illnesses and perceived stress. All subjects were then completely debriefed and asked if they had any questions (see Appendix C). They were given a form with names and phone numbers they could use if they had any questions or problems concerning their participation in the study (see Appendix D). Finally, they were asked not to discuss the experiment with other

students until after all the testing was completed, in order to ensure accurate testing of future subjects.

Measures

Personality: State/Action Orientation

The Action Control Scale (ACS-90; J. Kuhl, personal communication, December 1, 1993) was used to screen the students in the introductory psychology course (see Appendix E). The Action Control Scale consists of three subscales:

1. Action orientation subsequent to failure versus preoccupation (AOF).
2. Prospective and decision-related action orientation versus hesitation (AOD).
3. Action orientation during (successful) performance of activities (intrinsic orientation) versus volatility (AOP).

Each subscale consists of 12 items which describe a particular situation. Each item has two alternative answers (A and B), one of which is indicative of action orientation and the other of state orientation. Psychometric analyses of the first version of this Action Control Scale have yielded encouraging results: internal consistency coefficients ranging between 0.71 and 0.82 (Cronbach's alpha) and discriminant validity coefficients ranging between 0.01 and 0.36 (Kuhl, 1985).

In order to control for the effects of position, the action and state orientation answer alternatives were evenly divided within the questionnaire as to whether they were the first or the second choice given. For scoring the test, the number of action-oriented answers was tabulated. The sum of the action-oriented answers for each scale can vary between 0 and 12.

The three subscales were scored separately, since each scale deals with a different behavioral aspect of action orientation (see Appendix F for the scoring key for each subscale). Because the AOP has been shown to be affected by several variables other than action/state orientation (J. Kuhl, personal communication, December 1, 1993), it was not used as a selection criterion. The AOF and AOD scores were summed into a single index referred to as AOF/AOD. The 38 students with the highest AOF/AOD scores (identified as action-oriented) and the 37 students with the lowest AOF/AOD scores (identified as state-oriented) who agreed to participate were used in this study.

Physical Symptoms

The Cohen-Hoberman Inventory of Physical Symptoms (CHIPS; Cohen & Hoberman, 1983; Linville, 1987; S. Cohen, personal communication, December 11, 1993) was administered to all subjects (see Appendix G). This scale lists 39 common physical symptoms that reflect the typical health problems of college students. The scale excludes symptoms obviously psychological in nature (e.g., felt nervous or depressed). Each subject was asked to rate each item for how much that problem bothered or distressed the subject during the past two weeks. Items were rated on a 5-point scale from "not at all" to "extremely". Cohen and Hoberman (1983) found in two separate college student samples (sample sizes of 231 and 114), that the CHIPS was significantly correlated (.22 and .29 respectively) with the use of Student Health Facilities in the 5-week period following completion of the scale. The internal consistency (Cronbach's alpha) of the CHIPS, was .88 (Cohen & Hoberman, 1983).

Illness

Subjects listed, on a separate sheet, all health related problems that had occurred in the past two weeks (see Appendix H). This was used as an additional measure of health.

Perceived Stress

Subjects completed the Perceived Stress Scale (PSS: Cohen, Kamarck, & Mermelstein, 1983; Linville, 1987), a 14-item instrument designed to measure the degree to which situations in one's life are appraised as stressful (see Appendix I). For each item, subjects rated how often during the past two weeks they thought or felt a certain way. For example, "In the last two weeks, how often have you felt difficulties were piling up so high that you could not overcome them?" is one item on the scale. Subjects responded on a 5-point scale (never, almost never, sometimes, fairly often, very often) for each item. Cohen et al. (1983) reported a coefficient alpha reliability for the PSS at .84, .85, and .86 respectively in three separate samples; they reported a test-retest correlation of .85.

Cortisol

Ten milliliters of venous blood were drawn from each subject by a trained phlebotomist, the senior investigator, after the subject arrived at the Health Service and listened to the relaxation tape. Immediately after the last stress condition for the experimental group, and after the parallel no stress (resting) treatment for the control group, each subject was escorted back to the room designated for blood sampling and another ten milliliters of blood were drawn. Samples were processed and shipped to MetWest/MetPath, Clinical Laboratory at Denver, Colorado, where they were analyzed by immunoassay for cortisol levels. Ribi ImmunoChem Research, Inc. provided a grant to fund the cost of the cortisol assays and the cost of materials for the cognitive tasks.

Experimental Group - Stress Condition

As stated above, 26 of the 38 action-oriented subjects and 24 of the 37 state-oriented subjects were assigned randomly to the experimental group. The subjects in this group were exposed to 30 minutes of activity designed to create a moderate level of stress before the second blood sample was taken. The tasks in this condition were cognitive stressors which were thought to represent the kind of stress encountered by college students.

The tasks for the stress condition were selected by pilot work in which students, drawn from the same population, but who would not be serving as subjects later, performed various tasks and were asked to rate on 7-point scale, from "not at all" to "very", their perception of each task as stressful. All subjects in the pilot work were first given the Action Control Scale (ACS-90). Because it was hypothesized that the state-oriented subjects would be the most susceptible to the effects of stress, only the stress ratings of the state-oriented subjects in the pilot work (those who scored below the median scores of six on either the AOF or the AOD subscales of the ACS-90) were used to select the stress condition tasks. Because 50% of these state-oriented subjects rated the selective attention memory task, remote associates test, PASAT, and Stroop test (described below) at 5 or higher on the 7-point rating scale of stress, these tasks were selected for the stress condition. The mathematical problem-solving task (described below) was rated at 5 or higher by 32% of all the subjects, both state- and action-oriented, in the pilot testing, and so was judged to be acceptable to fill the remainder of the 30 minute testing period. The stress condition tasks selected are described below.

Selective attention memory task (as used by Kuhl, 1985). Subjects were shown a set of seven cards; each of which contained three words set in a square and three words set in a circle. The subjects were told they had five minutes to study all the cards, in any way they wished and were asked to memorize the words in the square on each card. After the subjects inspected the cards for five minutes, they were presented a list of 100 words, which contained all the words shown to the subjects plus additional neutral words (See Appendix J for a list of the words presented on the cards and the list of 100 words used for the recall test). The subjects were told they had two minutes to mark all the words they recognized from the cards, irrespective of whether these had been set in the circle or in the square. A timer was set for two minutes and when the bell rang, the experimenter instructed the subject on the next task.

Remote associates test (as used by Isen, Daubman, & Nowicki, 1987). Twenty Remote Associates Test items of differing difficulty levels were assembled (see Appendix K). Each item consisted of three words followed by a blank space. Subjects were instructed to provide, in the blank space, a word that was related to each of the three words given in the item. An example of a Remote Associates Test item (of moderate difficulty) is:

MOWER ATOMIC FOREIGN _____

The correct answer to this item is power.

Subjects were given the instructions for the task and told they had five minutes to read the instructions and complete the task. The experimenter set a timer for five minutes and instructed the subjects on the next task when the bell sounded.

Paced auditory serial addition task (PASAT; Gronwall & Sampson, 1974; Gronwall & Wrightson, 1974). The PASAT was developed as a measure of information-processing speed and efficiency, concentration skills, and immediate memory. The test required the subject to listen to a series of digits played on a tape recorder. The subjects were instructed to add the numbers according to the following rule: add the first number to the second number and tell the experimenter the answer, then add the third number to the second number and give the answer, and so on. There were 61 digits played, requiring 60 answers. The experimenter marked on a form which contained the right answers whether the response was right, wrong, or omitted, for each number played. After a practice series was played the experimenter turned off the recorder and asked if there were any questions. When the subject was ready to begin, the experimenter turned the tape on again. The tape presented the series of 60 digits four times with a 30-second rest interval between trials. The first series had a 2.4-second interval between digits, the second series had a 2-second interval between digits, the third series, a 1.6-second interval and the fourth series, a 1.2-second interval. When the tape ended after the fourth trial, the experimenter began instruction for the next task.

Stroop test. Subjects were asked to read aloud as quickly as possible, with a time limit of 120 seconds, a list of 112 color names in which each name was printed in a color different from the name. The subjects then were asked to read the list again by naming the color of ink in which the color names were printed. The experimenter set a timer for each section for 120 seconds and recorded each response as correct or incorrect.

Mathematical problem-solving task (as used by Bandura, Cioffi, Taylor, & Brouillard, 1988; Erber, & Tesser, 1992). A booklet of 50 math problems, four to a page, was presented to the subjects (see Appendix L). The mathematical problems required the subjects to perform sequentially a series of cognitive operations on three integers to arrive at a solution (e.g., 73-15x3). They were told they had five minutes to work at the task. To enhance personal involvement in the task, the subjects were informed that their work would be compared to others for accuracy and speed. If the timer rang before an assistant knocked at the door, signaling that 30 minutes had passed and the blood drawing room was ready, the experimenter marked the last problem completed and told the subject that they would be timed to see how long it took them to finish the booklet. They were stopped when the knock on the door signaled the experimenter that the subject should be taken to the blood drawing room. This procedure was designed to make sure that each subject was busy from the first blood test until the second and that a minimum of 30 minutes had passed between blood tests.

Control Group - No-Stress Condition

The remaining 12 action-oriented subjects and 13 state-oriented subjects were assigned to the control condition. After the first blood sample was taken, the subjects in the control group were asked to wait for the other subjects to complete their portion of the experiment. They were told they could read magazines or study if they would like to during the waiting period. After the second blood sample was taken they were asked to complete the measures assessing their physical symptoms, recent illnesses, perceived stress, and stress rating of the blood drawing procedure.

Stress Ratings of Blood Test and Cognitive Tasks

Subjects who completed the stress condition tasks were asked to rate how stressful each of the experimental tasks was. Tasks were rated on a 7-point scale from "not at all stressful" to "very stressful". Subjects from both the experimental and control conditions were asked to rate how stressful the blood drawing procedure was on the same 7-point scale (see Appendix M).

Results

Selection Criterion

The Action Control Scale (ACS-90) scores from the screening test, were used to select the students who were asked to participate. The scores from the AOF and AOD subscales of the ACS-90 were summed into a single index, the AOF/AOD. Those students at the highest levels of this scale, which represent extremes in action-orientation, and at the lowest levels of this scale, which represent extremes in state-orientation, were contacted until equal numbers from each extreme agreed to participate. Because of this selection criterion, approximately one half of the subjects were action-oriented, and approximately one half of the subjects were state-oriented.

Effect Size

An effect size of 1 was selected, using a clinically significant difference in cortisol concentration of 5-6 mg/dl, as used by Wiedenfeld et al. (1990) and Strauman et. al (1993) and a standard deviation of 5 mg/dl (MetWest Clinical Laboratories, 1995). Using the statistical power analysis procedure by Kraemer and Thiemann (1987), a sample size of 24 subjects per cell was determined to be necessary to achieve a power of approximately .65 for this effect size.

Recruitment Problems

There were 103 students contacted in order to obtain 75 subjects. Fifteen of the 103 students contacted, 11 with state-oriented scores and 4 with action-oriented scores, stated they were unwilling to have their blood drawn. Six of the 103 students contacted, 5 with state-oriented scores and 1 with an action-oriented score, stated they were not available at the times the experiment was offered. Three of the 103 students contacted, 2 with state-oriented scores and 1 with an action-oriented score, stated they did not need experimental credits. Seven students scheduled did not show up, 6 with state-oriented scores and 1 with an action-oriented score. Of these 7 subjects, 4 subjects, all with state-oriented scores, chose to reschedule. Of the 4 rescheduled subjects, 1 subject did not show up the second time. Because 25 problems (refusals to have blood drawn, scheduling problems, and missed appointments) came from the state-oriented subjects contacted and only 7 problems came from the action-oriented subjects, a chi-squared analysis was performed to test the null hypothesis that an equal number of problems originate from each group. Significantly more state-oriented subjects than action-oriented subjects refused to have their blood drawn, had scheduling conflicts, did not need credits, or did not show up at the agreed upon time, $\chi^2 = 10.16$, $df = 1$, $p < .01$.

Because this analysis was post-hoc, replication will be required to substantiate this finding. The process by which the personality factor of state versus action orientation could have an effect on behavior patterns such as these has been discussed by Kuhl (1985, 1992a, 1992b), and will be reviewed later in the discussion section.

AOF/AOD Scores

The final sample of subjects involved in the study, all had scores from the upper ⅓ or lower ⅓ of the possible scores from the AOF and AOD subscales of the ACS-90. The number of subjects at each level of AOF/AOD scores who participated is shown Table 1.

Table 1
Number of subjects at each level of AOF/AOD summation scores who participated in Experiment 1.

	AOF/AOD score	Number of Subjects
State-oriented	1	2
	2	3
	3	6
	4	7
	5	11
	6	5
	7	3
Action-oriented	17	10
	18	7
	19	6
	20	5
	21	4
	22	4
	23	1
	24	1

Cortisol

The pre-test and post-test blood samples were analyzed by immunoassay for cortisol levels by MetPath, Corning Clinical Laboratory, at Denver, Colorado. For 74 of the 75 subjects, the post-test blood sample was taken from 31 to 41 minutes after the pre-test blood sample. Because of an error, one subject in the no-stress condition was redrawn 16 minutes after the first sample was drawn. The results from this subject were reviewed and, because they were not outliers in the statistical sense, they were retained.

The cortisol assays in this study were taken between 3:00pm and 5:15pm and the results ranged from 2.7 MCG/DL to 42.3 MCG/DL, with a mean of 13.5 MCG/DL and a

standard deviation of 7.2 MCG/DL. Normal 4pm cortisol levels for the Midwest Rockies Population established by the Corning Clinical Laboratory range from 1.4 to 14.0 MCG/DL with a mean of 7.7 MCG/DL and a standard deviation of 3.1 MCG/DL.

A one sample t-test comparing the mean cortisol concentration obtained in the present study to the mean normal concentration established by MetPath, Corning Clinical Laboratories, for the Midwest Rockies Population revealed a significant difference in the two values, $t = 9.8$, $df = 149$, $p < .05$. Therefore the subjects in the present study, who represented extremes on the personality factor of state versus action orientation, also possessed a higher mean cortisol concentration and a wider variation of cortisol levels at mid-afternoon than the general population.

CHIPS

Scores on the inventory of Cohen-Hoberman Inventory of Physical Symptoms (CHIPS) in the past two weeks were obtained for each subject by adding the ratings for each of the 39 items marked by the subject. For each symptom a 4 represented extremely bothered by the symptom and 0 meant not bothered. Therefore, a high summation score represented a negative health status, indicating a high number of bothersome physical symptoms reported. Scores ranged from 0 to 66 with a mean of 21.

Illness Open-Ended Question

The open ended question on illnesses was scored as the total number of illnesses reported by each subject. If a subject made several entries which were symptomatic of one causal agent, these entries were counted as one. Forty-four of the 75 subjects listed illness in the past two weeks. This measure correlated with the CHIPS, $r = .63339$.

$df = 74$, $p < .001$, and consisted of responses that could be described using symptoms from the CHIPS measure. Therefore, all analyses of health status in this study used the scores from the CHIPS measure.

PSS

The Perceived Stress Scale (PSS) was scored by summing the responses from the 14 questions. Each question was scored with 0 representing absence of stress or positive responses to stress, and 5 representing the identification of stress or negative responses to stress. Therefore, higher scores represented more perceived stress than lower scores. The mean score for the PSS measure was 32, with scores ranging from 17 to 42.

Intercorrelations of Measures

Scores on the Cohen-Hoberman Inventory of Physical Symptoms (CHIPS), Perceived Stress Scale (PSS), each Action Control Scale (ACS-90) subscale and combinations of the subscales, were intercorrelated (see Table 2 below). Significant correlations were found between the CHIPS and the AOF, the AOD, and the summation of the AOF and AOD (AOF/AOD) subscales of the ACS-90. Given an internal consistency of .88 for the CHIPS, the correlation with the AOF/AOD of $r = -.60$ represents a substantial 36% variance accounted for. The AOF and the AOD correlated highly with the CHIPS as predicted. The AOP subscale of the ACS-90 did not correlate with the CHIPS. This could be explained by the findings that the AOP is affected by several variables other than action/state orientation (J. Kuhl, personal communication, December 1, 1993)

Table 2
Study 1: Correlations Among Subscales of ACS-90 Action Control Scale (AOF, AOD, AOP, AOF/AOD, AOF/AOD/AOP), Inventory of Physical Symptoms (CHIPS), and Perceived Stress Scale (PSS).

	AOD	AOF	AOP	AOF/AOD	AOF/AOD/AOP	CHIPS	PSS	ILLNESS#
AOD	—							
AOF	.8392**	—						
AOP	.0618	-.0651	—					
AOF+AOD	.9539**	.9637**	-.0056	—				
AOF+AOD+AOP	.9390**	.9158**	.2523*	.9662**	—			
CHIPS	-.5251**	-.6249**	-.0031	-.6025**	-.5838**	—		
PSS	-.1169	-.2524*	.0503	-.1967*	-.1774	.3507**	—	

Note. N=75.
*p<.05
**p<.001

Physical symptoms (CHIPS) and perceived stress (PSS) were more highly correlated with the AOF subscale than any other single subscale of the ACS-90. The selection criterion, a summation of the AOF and AOD, had the next highest correlation with both the CHIPS and the PSS. In future studies, it may be of interest to compare subjects having extreme scores on the AOF subscale of the ACS-90 with subjects having extreme scores on the AOD subscale of the ACS-90 in regard to correlation with health measures. Perhaps the AOF subscale measures a personality factor that impacts health in a way that is significantly different from the personality factor measured by the AOD subscale. Because the selection criterion in this study used a summation of the two scores, the evaluation of subjects with extremes in just the AOF subscale or just the AOD subscale is not possible with this sample. The fact that the AOF/AOD summation scores correlated highly with the CHIPS and the PSS in this study suggests that the selection criterion of extreme scores of the AOF/AOD summation was an adequate method of selecting a population for the analysis of the hypothesis of state and action orientation effects on health. For these reasons, all analyses were done using the AOF/AOD summation score to identify state- and action-oriented subjects.

As discussed in the introduction above, a large volume of literature has described the correlation of life stresses with health. Experiment 1 provides evidence that action control is also correlated with health. A graphic representation of the relationships between the personality factor of state versus action orientation with physical symptoms (CHIPS) can be found in Figure 1. As predicted by previous studies, stress was also found to be correlated with health. Figure 2 graphically displays the relationship between subjects high in perceived stress (scoring above the mean on the PSS) and low in perceived stress (scoring below the mean on the PSS) with physical symptoms (CHIPS).

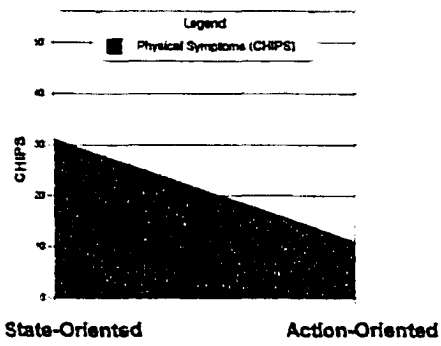


Figure 1. **Mean scores on physical symptoms (CHIPS) as a function of state vs. action orientation using AOF/AOD scores (n=75).**

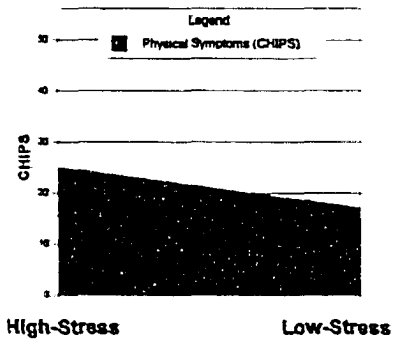


Figure 2. **Mean scores on physical symptoms (CHIPS) as a function of low vs. high perceived stress using PSS scores (n=75).**

As illustrated in these two figures, state versus action orientation was found to be more highly associated with physical symptoms than was low versus high perceived stress.

Cortisol

The experimental design was a 2 (condition: stress vs. no stress) x 2 (personality: action-oriented vs. state-oriented) between-subjects design with a pre-post within-subjects measure of cortisol concentration as the dependent variable. Analysis of variance revealed no main effects and no significant interactions. The state-oriented subjects did not have increased concentrations of cortisol from pre-test to post-test in comparison to the action-oriented subjects. The results of the analysis can be found in Table 3.

Table 3
2 (condition: stress vs. no stress) x 2 (personality: action-oriented vs. state-oriented) x 2 (cortisol: pre-test vs. post-test) repeated measures analysis of variance.

* * * * Analysis of Variance * * * *

Tests of Between-Subjects Effects.

Source of Variation	SS	DF	MS	F	Sig of F
Error	7266.70	71	102.35		
Personality	32.53	1	32.53	.32	.575
Condition	.01	1	.01	.00	.992
Personality by Condition	12.72	1	12.72	.12	.725

Tests involving Within-Subject Effect.

Source of Variation	SS	DF	MS	F	Sig of F
Error	390.49	71	5.50		
Cortisol	.08	1	.08	.01	.905
Personality by Cortisol	4.97	1	4.97	.90	.345
Condition by Cortisol	1.83	1	1.83	.33	.566
Person by Cond by Cortisol	2.43	1	2.43	.44	.509

Note. n=75.

Graphs of mean cortisol values for the state-oriented and the action-oriented subjects in the stress and the no-stress conditions at pre- and post-test are shown in Figure 3.

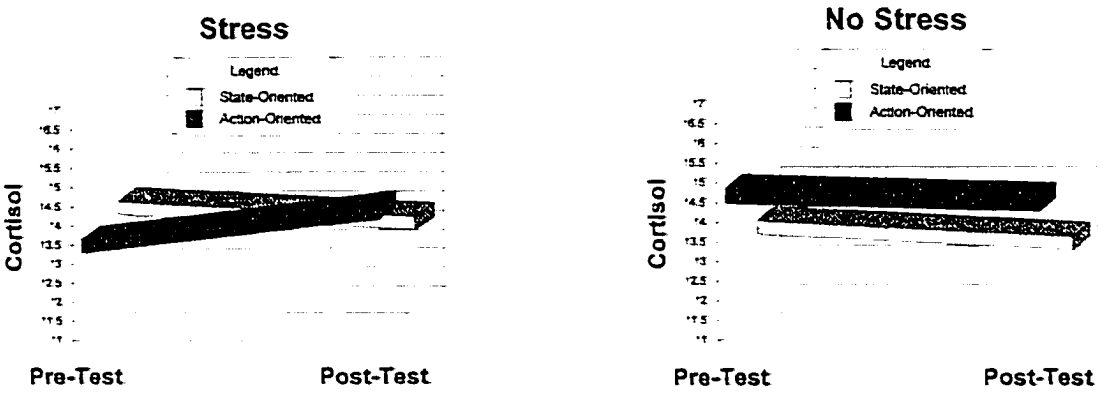


Figure 3. **Mean cortisol values at pre-test and post-test for state- and action-oriented subjects in the stress and no stress conditions (n=75).**

Clearly the state-oriented subjects did not have significantly increased concentrations of cortisol from pre-test to post-test in comparison to action oriented subjects, as expected. Furthermore, there was a trend in the opposite direction from that hypothesized, the action-oriented subjects showed an increase, although not significant, in cortisol concentrations from pre- to post-test in the stress condition.

Gender Difference

Another unexpected trend was noted in the screening results. In the sample of 345 students, 57% were female and 43% were male. The group of students scoring above the mean in action control were 51% female and 49% male, but the state-oriented group (scoring below the mean in action control) contained 66% females and 34% males. Because of this gender difference in action control, it was decided to reanalyze the data using gender as a factor. A 2 (condition: stress vs. no-stress) x 2 (gender: male vs. female) between x 2 within (cortisol: pre-test vs. post-test) analysis of variance revealed a significant 3 factor interaction (stress x gender x pre-post), $F(1,71) = 4.03$, $p < .05$. The male subjects had significantly greater increases in concentration of cortisol from pre-test to post-test than did female subjects in the stress condition, however, the male subjects had significantly greater decreases in concentration of cortisol from pre-test to post-test than did the female subjects in the no-stress condition. The results of this analysis can be found in Table 4, and graphs of the three factor interaction are shown in Figure 4.

Table 4
2 (condition: stress vs. no-stress) x 2 (gender: male vs. female) x 2 (cortisol: pre-test vs. post-test) repeated measures analysis of variance.

* * * * * * Analysis of Variance * * * * * *

Tests of Between-Subjects Effects.

Source of Variation	SS	DF	MS	F	Sig of F
Error	7138.69	71	100.54		
Condition	.63	1	.63	.01	.937
Gender	158.24	1	158.24	1.57	.214
Condition by Gender	4.31	1	4.31	.04	.837

Tests involving Within-Subject Effect.

Source of Variation	SS	DF	MS	F	Sig of F
Error	375.32	71	5.29		
Cortisol	.13	1	.13	.02	.875
Condition by Cortisol	3.19	1	3.19	60	.440
Gender by Cortisol	.25	1	.25	.05	.830
Cond by Gend by Cortisol	21.30	1	21.30	4.03	.049

Note. n=75

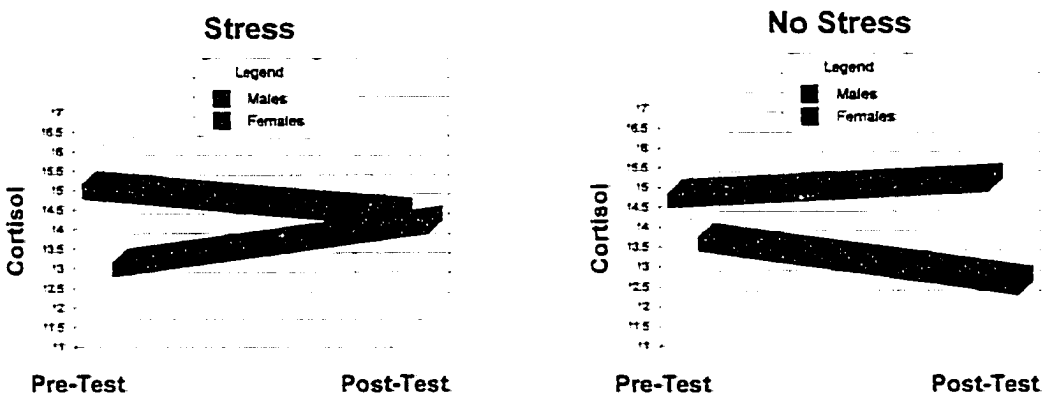


Figure 4. Mean cortisol values at pre-test and post-test for male and female subjects in the stress and no-stress conditions (n=75).

Let us examine these results more specifically in terms of male/female responses. In the stress condition the differences in cortisol concentrations between male and female

subjects decreased from pre- to post-test. While males in the no-stress condition again had lower concentrations of cortisol in the pre-test than females, the difference between them increased at post-test as the males' cortisol concentrations decreased further and the females' cortisol concentrations increased slightly.

In the no-stress condition male subjects' cortisol concentrations decreased from pre-test to post-test, consistent with diurnal patterns. However, in the stress condition male subjects' cortisol concentrations increased from pre-test to post-test. These findings are consistent with other studies in which cortisol concentrations increase after stress manipulation. (Dugué, Leppänen, Teppo, Fyhrquist, & Gräsbeck, 1993; Wiedenfeld et al., 1990). These patterns did not hold, however, in the female population. In the no-stress condition the female subjects' cortisol concentrations increased slightly, while in the stress condition the female subjects' cortisol concentrations decreased slightly.

Since the males and females reacted in opposite directions it was of interest to see if the hypothesis of the present study would be supported in one gender population but not in the other. A 2 (condition: stress vs. no-stress) x 2 (personality: action-oriented vs. state-oriented) between x 2 within (cortisol: pre-test vs. post-test) analysis of variance on just the female subjects revealed no main effects and no significant interactions. The state-oriented subjects did not have significantly increased concentrations of cortisol from pre-test to post-test in comparison to the action-oriented subjects. The same was true of the analysis of the data from just the male subjects. The results of both analyses of variance can be found in Table 5.

Table 5
Males/Females
2 (condition: stress vs. no-stress) x 2 (personality: action vs. state orientation) x 2 (cortisol: pre-test vs. post-test) repeated measures analysis of variance of data from male subjects only / female subjects only.

*******Analysis of Variance***********

Tests of Between-Subjects Effects.

Source of Variation	SS	DF	MS	F	Sig of F
Error	1094.20/5932.46	31/36	35.30/164.79		
Condition	1.23/3.94	1/1	1.23/3.94	.03/.02	.853/.878
Personality	11.22/49.26	1/1	11.92/49.26	.34/.30	.565/.588
Condition by Personality	9.73/53.20	1/1	9.73/53.20	.28/.32	.603/.573

Tests involving Within-Subject Effect.

Source of Variation	SS	DF	MS	F	Sig of F
Error	209.49/158.38	31/36	6.76/4.40		
Cortisol	.1/.10	1/1	.01/.10	.00/.02	.974/.883
Condition by Cortisol	16.54/4.07	1/1	16.54/4.07	2.45/.92	.128/.343
Personality by Cortisol	.36/4.61	1/1	.36/4.61	.05/1.05	.820/.313
Cond by Person by Cortisol	.84/.11	1/1	.84/.11	.12/.03	.727/.874

Note. n=35/40

Graphs of the mean cortisol concentrations at pre-test and post-test for the stress and the no stress conditions in both male and female subjects can be found in Figure 5.

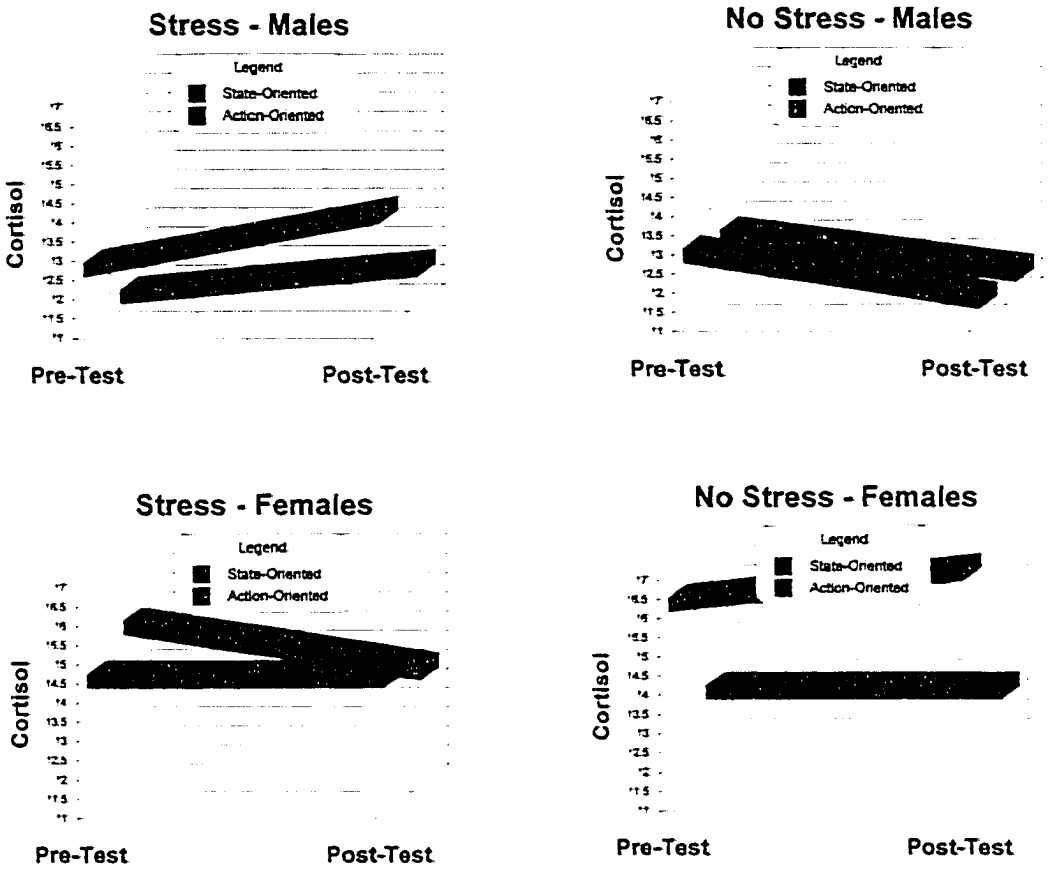


Figure 5. **Mean cortisol concentrations at pre-test and post-test for state- and action-oriented subjects in the stress and no-stress conditions for male and female subjects separately.**

Although the analysis of variance did not reach significance, it can be seen in Figure 5 that, in the stress condition, the action-oriented females displayed patterns in cortisol production more similar to male subjects' patterns than to the state-oriented females'

patten of cortisol response. A power analysis suggested that the number of subjects needed to investigate this trend was not present in this sample. The number of subjects in each cell of the previous analysis can be found in Table 6.

Table 6
Number of subjects in each of the experimental conditions if gender is used as a factor.

	Stress		No Stress	
	Hi Action	Lo Action	Hi Action	Lo Action
Males	15	9	6	5
Females	11	15	6	8

Because of the lack of power, it is impossible to tell if the observed trends are a) artifacts of sample variation in very small groups or b) a meaningful effect for which there is insufficient power to isolate in this design. Further research will be required to investigate this interesting question.

Stress of Blood Drawing Procedure

Because the stress of the blood drawing procedure might have been a factor in the manipulation involving stress, the ratings of stress from the blood test were analyzed. A frequency distribution of the ratings of stress from the blood drawing procedure by gender and personality (action-oriented vs. state-oriented) is given in Figure 6. The state-oriented subjects of both genders gave higher ratings of stress for the blood test than did the action-oriented subjects.

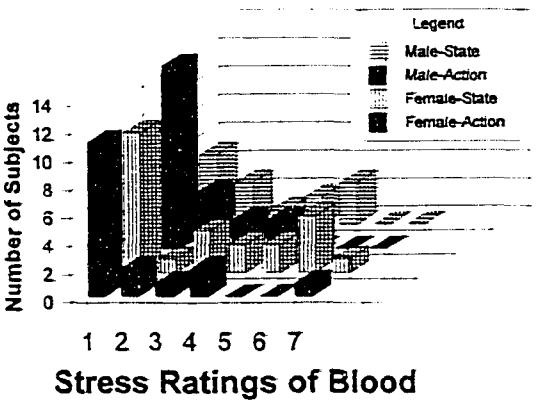


Figure 6. **Frequency distribution of the ratings of stress from the blood drawing procedure by personality (action-oriented vs. state-oriented) and gender (n=75).**

A 2 (personality: state-oriented vs. action-oriented) x 2 (gender: female vs. male) analysis of variance on the stress rating of the blood test revealed a main effect for the personality factor, state versus action orientation. $F(1,1) = 6.8$, $p < .05$. Results of this analysis can be found in Table 7.

Table 7
2 (gender: male vs. female) x 2 (personality: state- vs. action-oriented) between subjects analysis of variance.

* * * ANALYSIS OF VARIANCE * * *					
Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Main Effects	24.589	2	12.294	4.284	.018
Gender	2.059	1	2.059	.717	.400
Personality	19.517	1	19.517	6.800	.011
2-Way Interactions	.072	1	.072	.025	.875
Gender x Personality	.072	1	.072	.025	.875
Error	203.779	71	2.870		
Total	228.667	74	3.090		

Note. n=75

To control for the effect of the stress of the blood tests, a 2 (condition: stress vs. no stress) x 2 (personality: action-oriented vs. state-oriented) x 2 (cortisol: pre-test vs. post-test) analysis of variances for each gender population was done using the blood rating as a covariate. The stress of the blood test was not a significant covariate in the analysis for either population and did not appreciably alter the previously reported results.

EXPERIMENT 2

Because personality factors may have an additive influence on health after many years, or as the subject ages, the personality factor of state versus action orientation was measured in an older population. Experiment 1 was modified as a prospective study in a population over 55 years of age.

Method

Subjects

A total of 122 adults over 55 years old living in western Montana were contacted and asked to participate in the study. Fifty-seven subjects, 55 to 95 years of age, agreed to participate. The subjects were from nine locations in six towns in Western Montana. The locations were senior citizen centers where people come for lunch or meetings. These subjects included people who lived in their own homes and people who lived in independent living apartment complexes.

Procedure

The measures were completed in two sessions, two weeks apart. In Session 1, subjects completed the Action Control Scale (ACS-90), a health questionnaire, and then completed a questionnaire that assessed stress by evaluation of their life events in the past two months. A cover page for the questionnaires in each session described the confidentiality of answers to the questions and included demographic questions such as age and marital status (see Appendix N). In Session 2, conducted two weeks later, subjects were asked to complete a health questionnaire reflecting their health during the preceding two weeks. In both sessions subjects were given an opportunity to ask questions and told their help was valuable to the researcher.

Measures

State/Action Orientation

The Action Control Scale (ACS-90), as previously described, was administered to each subject.

Life Stresses

The Routines, Uplifts, Challenges and Hassles List (RUCHL; S. Wallsten, personal communication, December 7, 1993) was used to assess life stresses in the past two months. The RUCHL (Wallsten & Snyder, 1990; see Appendix O) was developed to include a wide range of events appropriate to adults of late middle age and older. Items selected for the RUCHL exclude psychological symptoms. However, the RUCHL includes three items related to chronic or acute physical illness, despite the possibility of psychological components, because many people 65 and over deal regularly with problems such as arthritis.

The RUCHL contains 81 listed items and five open lines so respondents can add salient experiences not captured on the RUCHL itself. Most items are worded in as neutral a manner as possible. To the right of each experience on the list is a column listing the category types by initial: Routine (R), Uplift (U), Challenge (C), and Hassle (H). The next column contains a rating scale for positive impact that goes from no impact (0) to extreme impact (4). The last column contains a rating scale for Negative Impact that also runs from 0 to 4.

Wallsten (1993) found in a study that compared elderly caregivers (individuals providing home care to a spouse or parent with Alzheimer's disease) to elderly

noncaregivers that negative impact ratings were derived not only from items endorsed as hassles, but to a large extent from items endorsed as routines and challenges. Noteworthy from this work was that differences were not found between groups of caregivers and noncaregivers in endorsing activities as hassles, but differences were found in negative impact ratings. For this reason, in the study reported here, the RUCHL was scored as the total negative impact rating over all endorsed items.

The definitions used in this measure for routines, uplifts, and challenges are based on Lazarus' and Folkman's stress appraisal theory (Lazarus & Folkman, 1984) and are summarized below.

Routines: Experiences that are regular or usual, not distinctive in the course of a day.

Uplifts: Experiences that make one feel good; sources of peace, satisfaction, happiness, or joy. In general, they are not taxing.

Challenges: Experiences that are demanding but are also energizing or invigorating.

Hassles: Experiences that are irritating, frustrating, or distressing. In general, they are taxing, undesirable, and not sought after; rather they are imposed by circumstances.

Subjects were told to examine each item on the RUCHL in turn and to respond to an item only if they had experienced it in the past two months. Otherwise, they were instructed to proceed to the next item. Each experience item required classification by type (routine, uplift, challenge, or hassle) and was then rated for both its positive and its negative impact.

Health

A measure of self-reported health developed by Weinberger et al. (1987) was used (see Appendix P). A number of studies have validated self-ratings of health status among elderly persons (e.g. Bear, 1988). Aside from being strongly correlated with physicians' assessments, subjectively rated health status has been found to be a better predictor of mortality than objective measures (Weinberger et al., 1987).

Subjects were asked to evaluate (a) their overall health (1 = poor, 2 = fair, 3 = good, 4= excellent); (b) their level of pain (1 = a lot, 2 = some, 3 = none); (c) their difficulty getting around (1 = a great deal, 2 = some, 3 = none); (d) their dependence upon others for performing activities of daily living, such as eating, bathing, dressing, grooming, and walking across the room (1 = totally dependent on others, 2 = need some help, 3 = need no help); and (e) limitations on activities imposed by their health (1 = severely limited, 2 = somewhat limited, 3 = not limited). They also were asked the number of prescription drugs they were currently taking.

Four questions addressed more objective issues of health. In session 1 these questions asked the respondents if they had been sick in bed for at least four consecutive days in the last two weeks (and in the past year), had been hospitalized in the last two weeks (and in the last year), and had seen a physician in the last two weeks about a health problem other than routine exam (and in the last year). In session 2 these four questions asked the respondents to assess only the last two weeks.

Results

AOF/AOD Scores

As in Experiment 1, the three ACS-90 subscales were scored separately, since each scale deals with a different behavioral aspect of action control. As in Experiment 1, the AOF and AOD scores were summed into a single index referred to as AOF/AOD. The AOF/AOD scores ranged from 6 to 24 with a mean of 17. A listing of the number of subjects at each level of AOF/AOD can be found in Table 8.

Table 8
Number of subjects at each level of AOF/AOD summation scores who participated in Experiment 2.

AOF/AOD	Number of Subjects
6	2
7	2
8	2
10	1
11	3
12	2
13	3
14	2
15	5
16	5
17	4
18	6
20	1
21	5
22	5
23	2
24	7

Note: n=62

Because there was not a selection process as in Experiment 1, this population did not represent extremes of state- and action-orientation. The distribution of AOF/AOD scores of the subjects who did participate were perhaps skewed by selection of personality types who favored the social gathering sites where subjects were found. The population represented in Experiment 2 had scores which were more often at the upper or action-

oriented end of the action control continuum than at the state-oriented extreme. A graph showing the AOF/AOD scores of subjects in the two experiments can be found in Figure 7.

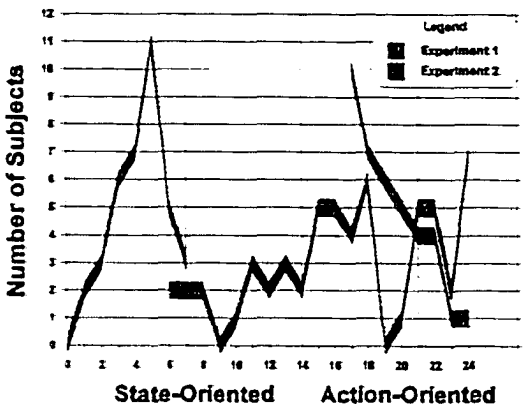
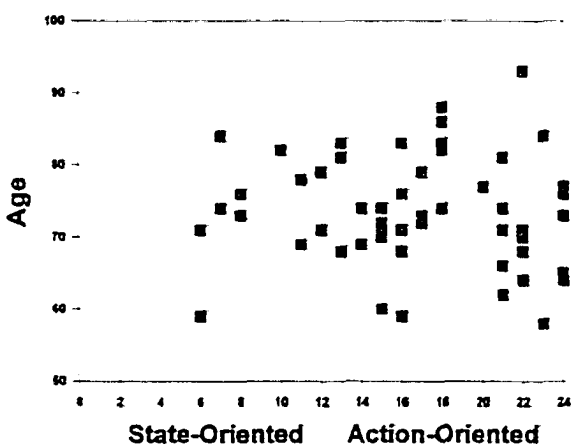


Figure 7. **Number of subjects at each level of (AOF/AOD) in Experiments 1 and 2.**

The age and gender distribution in each of the levels of action control in Experiment 2 was not appreciably skewed. A graph showing the age and gender of subjects at each level of action control can be found in Figure 8.

Figure 8. **Female (light red boxes) and male (dark blue boxes) subjects in Experiment 2 by age and AOF/AOD summation scores.**



RUCHL

The RUCHL was scored as the total negative impact rating over all items that the subjects endorsed. This score was used as the stress measure in the statistical analysis. The 57 subjects had scores on RUCHL that ranged from 0 to 114, with a mean of 48.

Health Scores

A total score was calculated for each health questionnaire. Each answer was coded with the higher number representing positive health status and lower numbers representing negative health status. Thus, a high total score represented good health. The health questionnaire was given at the first session, at the time the RUCHL was completed. This questionnaire contained each of the three objective questions, 1) sick in bed 2) visits to the physician and 3)hospitalization, in two forms. First as it pertained to the last year and second, as it pertain to the last two weeks. The health questionnaire was repeated at Session 2 with the questions pertaining to health in the past two weeks only. Three scores were generated from these two questionnaires: a Session 1 - one-year score adding all answers except the three objective questions about the past two weeks, a Session 1 - two-week score adding all answers except the three objective questions about the past year, and a Session 2 - two-week score adding all answers. In this way Session 1 - two-week and Session 2 - two-week scores would have the same value unless health status changed.

The design was a prospective, between-subjects design with a self-report measure of health as the dependent variable. Because the AOF/AOD scores and PSS scores of subjects in Experiment 2 represented points along a continuum rather than a discrete separation between the two poles of either scale, a regression analysis was used to assesses the relationship of the variables. The regression of Session 2 - two-week health

scores on the personality factor of state versus action orientation and perceived stress did not reach significance. The regression of Session 1 - two-week health scores on the personality factor of state versus action orientation and perceived stress was significant. $R^2 = .17$. $df = 3,34$. $p = .04$. The results of both of these analyses can be found in Tables 9 and 10.

Table 9
Regression of Session 2 - 2-week health score on the personality factor (state- vs. action-orientation) and perceived stress (RUCHL) and personality/perceived stress interaction term.

* * * * MULTIPLE REGRESSION * * * *

Multiple R	.34012
R Square	.11568
Adjusted R Square	.03277
Standard Error	2.21009

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	20.44625	6.81542
Residual	32	156.30375	4.88449

F = 1.39532 Signif F = .2621

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
Personality	.060405	.071610	.145510	.844	.4052
Perceived Stress	.014233	.009997	-.241647	-1.424	.1642
Interaction Term	.309427	.344202	.154040	.899	.3754
(Constant)	19.561531	1.452875		13.464	.0000

Note. N=37

Table 10
Regression of Session 1 - 2-week health score on personality (state- vs. action - orientation) and perceived stress (RUCHL) and personality/perceived stress interaction term.

* * * * MULTIPLE REGRESSION * * * *

Multiple R	.40832
R Square	.16672
Adjusted R Square	.09320
Standard Error	2.24865

Analysis of Variance

	DF	Sum of Squares	Mean Square
Regression	3	34.39732	11.46577
Residual	34	171.91847	5.05643

F = 2.26757 Signif F = .0983

Variables in the Equation

Variable	B	SE B	Beta	T	Sig T
Personality	.156605	.072477	.355468	2.161	.0379
Perceived Stress	.005892	.009749	.095415	.604	.5496
Interaction Term	.249788	.329397	.124327	.758	.4535
(Constant)	16.297366	1.418071		11.493	.0000

Note. N=37

Intercorrelations of Measures

Correlations were computed between the scores on Session 1 and 2 health questionnaires, the RUCHL, each ACS-90 subscales and combinations of the subscales. Significant correlations were found between the Session 1, but not Session 2 health scores, and the AOF and AOD subscales of the ACS-90. In light of the fact that reliability coefficients for the health scores were not known and that the correlations were .36 or less, it would be hard to attach much practical significance to them. The difficulty of completing the perceived stress measure (RUCHL) may have been one reason for the weak findings with this measure. All of the correlations can be found in Table 11.

Table 11
Correlations Among Subscales of ACS-90 Action Control Scale (AOF, AOD, AOP, AOF/AOD, AOF/AOD/AOP), Session 1 - year health scores (1-yr), Session 1 - two-week health scores (1-wk), Session 2 - two-week health scores (2-wk),and perceived stress (RUCHL).

	AOF	AOD	AOP	AOF/AOD	AOF/AOD/AOP	1-yr	1-wk	2-wk	RUCHL
AOF	--								
AOD	.5442**	--							
AOP	.1402	.2337*	--						
AOF+AOD	.8689**	.8870**	.2201*	--					
AOF+AOD+AOP	.7796**	.8352**	.5807**	.9214**	--				
1-yr	.2902*	.3236*	.1219	.3542**	.3445*	--			
1-wk	.3493*	.2905*	.0804	.3636*	.3332*	.8753**	--		
2-wk	.1599	.2117	.0945	.2131	.2163	.6847**	.7624**	--	
RUCHL	-.2384	-.0879	.0500	-.1773	-.1262	.0436	.0319	-.2636	--

Note. N=37.
*p<.05
**p<.001

DISCUSSION

Experiment 1 provides some evidence that state/action orientation is correlated with physical health. State-oriented college students reported more physical symptoms that reflect the typical health problems of college students than did action-oriented college students. The correlation of state/action orientation and physical health was $r = .60$ and, given the internal consistency of the health measure, represented a substantial 36% variance accounted for. State-oriented subjects in Experiment 2 also indicated more health problems than action-oriented subjects. However, since the correlations in Experiment 2 were .36 or less and reliability coefficients for the health scores were not known, the practical significance of these findings is uncertain.

A possible explanation for the difference in the strength of the findings in the two experiments may be that the subjects in Experiment 2 were not pre-selected for their extreme scores on action or state orientation, as the subjects in Experiment 1 were. There was less variation in state/action orientation scores for subjects in Experiment 2 than for those in Experiment 1. In fact, the subjects in Experiment 2 had scores on the ACS-90 which were skewed toward the action-orientation extreme of the scale. This may suggest that action-oriented people are more likely to attend senior citizen centers than state-oriented people, or at least are more likely to agree to fill out questionnaires for a visiting college student when they are at senior citizen centers. The fact that there was a correlation between health and state/action orientation even when there was very little variation in state/action orientation could suggest that the relationship between them is a substantial one.

In addition to determining if identification of an individual's personality as state-oriented predicts negative health outcome, this study examined one possible mechanism for this effect. As described earlier, the literature suggests that state-oriented individuals have coping responses that appear to be passive distress responses instead of active coping responses. The passive response system is the hypothalamic-pituitary-adrenocortical pathway which results in cortisol production. The literature suggests that virtually all the components of the immune response are inhibited by cortisol. Therefore, one mechanism for negative health outcomes may be that state-oriented individuals have a disposition to enter the passive distress response to stressors with the resultant production of cortisol more than do action-oriented individuals. The inhibition of the immune response by cortisol could then lead to negative health outcomes.

In Experiment 1 the results of the cortisol measures did not support this hypothesis. In fact, there was a trend in the opposite direction from that hypothesized. It was the action-oriented subjects, rather than the state-oriented subjects who showed an increase in cortisol concentrations from pre- to post-test in the stress condition. The pre- to post-test cortisol response for the action-oriented subjects was not significantly different from the state-oriented subjects' responses, but while the normal diurnal variation in cortisol at the hour tested predicts a slight decrease in cortisol production, the action-oriented subjects showed an increase in cortisol concentrations from pre- to post-test and the state-oriented subjects showed a decrease in cortisol concentrations from pre- to post-test.

The postulation of increases in cortisol production causing negative health outcomes was the most creative step I took in my line of reasoning. It is possible that the reverse is

true, that cortisol production represents the cut-off mechanism of a healthy immune response which represents a positive health response. Cohen and Crnic (1982) describe the impressive growth of knowledge about cortisol in particular, and the pituitary-adrenal cortical system in general, since the effects of adrenal cortex extracts on the lymphatic system were discovered in the late 1930s. The activation of the immune system leads to increased secretion by the pituitary and adrenal glands which act directly and indirectly on the hypothalamus to stimulate the synthesis and secretion of corticotropin-releasing hormone. This hormone in turn stimulates the release of corticotropin and thereby of cortisol (Reichlin, 1993). Cortisol is immune suppressive and involved in the regulation of normal immune responses (Cohen & Crnic, 1982). As a control mechanism for the immune response, the presence of cortisol could also be an indication that an immune response has developed, which would be a protective factor against negative health outcomes. Whether these responses can influence the course of disease and infection in humans is a subject of intense research and has not been satisfactorily resolved at this time (Reichlin, 1993). Because action-oriented subjects reported less negative health outcomes than state-oriented subjects, the trend shown in Experiment 1 toward increased cortisol production after stress for action-oriented subjects could reflect this positive health explanation of cortisol production.

Although the direction of the response was predicted in the direction of state-oriented subjects showing greater cortisol production after stress, the fact that there was a trend for action-oriented subjects to be more responsive in the production of cortisol after stress is of interest. To further evaluate this trend it is of value to consider a post hoc analysis of gender difference in the cortisol response in the study reported here.

In much of the current literature there is a notable absence of the use of female subjects' data of cortisol production after stress or of a discussion of gender differences in cortisol production after stress when differences have been found. Because of this deficiency in the literature a gender difference was not predicted in this study, however, a significant 3 factor interaction (stress x gender x pre-post) was found in Experiment 1.

An analysis of the literature describing the measurement of cortisol after stress revealed the following gender effects in the production of cortisol and the interpretations given. Wiedenfeld et al. (1990) did not mention gender effects when describing cortisol measurement as a "sensitive marker of psychological stress" (p. 1085). Wiedenfeld et al. had snake phobics participate in three self-efficacy acquisition sessions on the same weekday mornings of three successive weeks. The first session had no exposure to snakes, the second session involved minimal threats of contact with a snake in the context of acquiring a sense of efficacy, and the third session involved menacing activities such as having the snake crawl on them and bringing it to their face. They reported that:

> If subjects continued to display an elevated level of cortisol after they had been thoroughly familiarized with the range of coping tasks introduced in the session, it would reflect a high level of phobic stress. Therefore, subjects' level of cortisol at the end of each session served as the main measure in the analyses. Subjects displayed elevated cortisol levels at the beginning of each phase but as the session progressed, cortisol levels declined (p. 1087).

The subjects in the Wiedenfeld et al. study were 19 females and 1 male subject and the sessions were held during the time of day when cortisol levels normally are decreasing due

to diurnal variation. If females do not generally respond to stress by increasing cortisol production, as argued later, this measure of phobic stress would be inappropriate in this study.

Dugué et al. (1993) described the measurement of cortisol as a common indicator of stress level, but then reported "we measured only the samples from the male volunteers in the audiovisual color test because they reacted more strongly to this test than the females (the latter had no rise in their cortisol)" p. 556. Dugué et al. also reported measuring cortisol in subjects about to enter an airplane before making a first parachute jump from an airplane. They compared this level to the subject's own cortisol level taken in a control condition of a 15 minute resting period some days before or after the jump. They reported that the level of cortisol in males was slightly higher, although not significantly so, before the thrill of making a first jump from an airplane with a parachute than in a control situation. For females there was no difference in the level of cortisol in the two conditions. There was no interpretation of this gender difference in cortisol production. Unfortunately the levels of cortisol were not taken immediately after the jump, which may have been a more accurate measure of the cortisol response to stress.

Malarkey, Kiecolt-Glaser, Pearl and Glaser (1994) used a 30-minute marital conflict task with 90 newlywed couples to test pre- and post-test changes in prolactin, epinephrine, norepinephrine, ACTH, growth hormone, and cortisol. Hostile behavior was associated with pre- to post-test changes in all hormones except cortisol. They found that differences in all hormones, except cortisol, between high- and low-hostile sessions were relatively larger in women than men. Adler (1993) reports a suggestion by the second author of the

Malarkey et al. marital conflict study. Kiecolt-Glaser. that in newlywed conflict there is an interaction between gender. stress and immune function because one sex finds a problem more stressful than the other does. Kiecolt-Glaser concludes that because women are traditionally more aware of and more sensitive to marital conflict. it makes sense that the woman's responses would be different than her husband's during a heated discussion. Malarkey et al. (1994) did not use this line of reasoning to assess the cortisol response in their study. Clearly. if cortisol was a sensitive indicator of stress for all subjects. their reasoning would suggest a greater cortisol response from the female subjects who were stressed and a lesser response from the male subjects who were not as sensitive to the marital conflict.

All of the above inconsistent interpretations or absence of consideration of gender effects in cortisol responses after stress could have been better interpreted in light of work by Frankenhaeuser (1979) at the University of Stockholm. Sweden. Frankenhaeuser reports that much of the published data were from male subjects and hold only in part. if at all. for females. She reports that during rest and relaxation. gender differences in psychoendocrine excretion are generally slight (provided one allows for body weight). It is only in stressful and challenging situations that consistent sex differences appear. indicating a lesser reactivity of the adrenal-medullary system in females than in males.

Frankenhaeuser (1979) reports that in a series of experimental conditions involving moderately intense stress. little. if any. increase of adrenaline was found in women. whereas males in the same situations showed a significant rise. Adrenaline is a catecholamine and cortisol is a corticosteroid. Catecholamines play a main role in

mobilizing acute adaptive resources. corticosteroids provide more enduring support in the case of prolonged stress.

In a study of gender differences in response to more intense and long-lasting stressors. students in Finland who had just completed a six-hour exam were tested for catecholamines and cortisol (Frankenhaeuser. 1979). This exam was very important. as it determined whether the student would be admitted to the university. and also potentially had a lasting influence on success in competing in the labor market. The concentrations of catecholamines and cortisol were compared to levels taken after ordinary school work which. of course. was also somewhat stressful. Therefore. any changes would be smaller than they would have been if compared to true baseline values. After completing this very challenging exam. both sexes did increase their adrenaline secretion to a significant degree. But the rise was significantly greater for the males than the females. and the rise in cortisol was significant for the males only.

Frankenhaeuser (1979) and her colleagues speculated that these gender differences may be associated with learned differences associated with the social roles of males and females. In order to approach this problem. they evaluated interindividual differences between women in different social roles. the hypothesis being that those women who have adopted a male role in. for instance. their professional life. would tend to exhibit the neuroendocrine stress responses typical of men. A study was done of the catecholamine and cortisol excretion of male and female engineering students. where less than 5% of the students were women. In a laboratory experiment in which these students performed a color-word conflict task compared to a control condition spent in inactivity. adrenaline and cortisol excretion increased to nearly the same degree in the females as in the males.

Frankenhaeuser's data (1979) would suggest that Wiedenfeld et al. (1990) should not have used cortisol as a sensitive marker of psychological stress for female subjects, and should not have interpreted the decline of cortisol in the morning sessions as an indicator of decreased phobic stress in a subject pool of 19 women and 1 man. Frankenhaeuser's work would also suggest that Dugué et al. (1993) could have used a gender difference explanation for discarding the data on the females subjects in the audiovisual color test and for the absence of elevation in cortisol concentrations in the parachute test.

The absence of recognition in the recent literature of the converging evidence of gender differences in cortisol response, and the lack of awareness of Frankenhaeuser's (1979) work in Europe led me to hypothesize that the effects of personality on the endocrine response after stress would be independent of gender. Therefore I did not require that my sample size be large enough to evaluate the personality factor of state/action orientation in male and female subjects separately. A power analysis in conjunction with Experiment 1 suggested that the trend for the action-oriented female subjects to respond in a pattern more similar to male subjects than to state-oriented female subjects in the production of cortisol, could not be interpreted. Because this trend is similar to the results of Frankenhaeuser's study on female engineering students producing cortisol after stress to nearly the same degree as male engineering students, there are some interesting possibilities for further research. For example, it is interesting to speculate that the personality factor of state/action orientation might be involved in the different endocrine responses of the subjects Frankenhaeuser describes as non-traditional females.

In Experiment 2 cortisol levels after stress were not measured but health outcomes were measured as a function of the personality variable of state/action orientation and an assessment of life stresses. Several methodological problems became apparent in Experiment 2. First, as described above, the subjects available for this study did not represent a large variation in state/action orientation. Second, the variation in the scores on the RUCHL was small. Although the RUCHL measure was developed for older adults and has been used successfully to measure life stresses in older adults (S. Wallsten, personal communication, December 7, 1993) it was difficult to complete for the subjects. There were complaints about the length of the RUCHL from the subjects as they tried to complete it and some subjects refused to finish it. One possible explanation for the problems encountered was the fact that the subjects were gathered for purposes other than participating in a study and had no incentive to complete the questionnaire except to be kind to a visiting college student. The questionnaire required thoughtful effort to complete. Perhaps incentives and prescheduled appointments would have resulted in more complete response to the questionnaire.

Another possible complication for the analysis of the effects of stress on health in Experiment 2 could be in the two-week prospective design of the study. Linville (1987) found effects of stress on physical health in such a two-week prospective design in a population of college students. The health problems most often described in the responses of the older adults in Experiment 2 did not reflect temporary colds and infections as might be expected among younger adults, but the more permanent conditions such as arthritis, and declining vision, hearing, and mobility. These conditions may be reflective of

cumulative life stresses but may not vary in two weeks because of recent life stresses. The variation in the health status scores was larger at Session 1, reflecting the past 12 months, than it was at Session 2, reflecting the past two weeks. The Session 1 health scores also correlated more strongly with state/action orientation, perhaps reflecting the effect of this larger variation of chronic conditions on the physical health of older adults. Also Session 2 health scores reflecting the past two weeks did not correlate with the personality variable of action control as highly as the very same measure taken at Session 1. This may also have reflected the declining interest and involvement of these subjects in being asked after two weeks to once again complete a questionnaire.

In conclusion, this study presents some evidence that state/action orientation is correlated with physical health. In addition, the data from this study suggest mechanisms by which state/action orientation may impact physical health, and could be the focus of future research. First, state/action orientation may interact with gender with resultant differences in endocrine responses to stress. An application of such a finding would be in the study of immune function. Assessing state/action orientation may be important in exploring the gender differences in stress effects on immune function. Research involving drug therapy for disease states may also benefit from knowledge of the interaction of state/action orientation and gender on immune function.

A second suggestion for future research is suggested by the post-hoc analysis of recruitment problems reported here. In Experiment 1 action-oriented subjects were more likely than state-oriented subjects to agree to participate in this study, which could improve the status of their grade in a psychology course. In light of the correlation with

positive health by the action-oriented subjects and the increased willingness of action-oriented subjects to participate and follow through with the procedure of this rather demanding experiment, it would be of interest to know if adopting and adhering to preventive health practices is predicted by state/action orientation.

Application of the identification of such a personality variable with effects on health promotion actions would be to develop more individualized programs for health promotion. As Kuhl (1992b) admits, his theory of action control does not contain any assumptions excluding the possibility that a given individual's measured disposition can be superseded by situational determinants or changed by training. Since subjects can be completely immunized against the effects of learned helplessness by instructing them to verbalize their hypothesis about the correct solution while working on the problem (ie. inducing action orientation), perhaps state-oriented individuals could be induced to adhere to a health program by methods which induce action orientation. In keeping with this application it could also be suggested that action-oriented individuals would not benefit from the same intervention, and such a program for these individuals would not be cost effective.

The investigation of individual differences in health outcomes may benefit from the concept of state/action orientation. Kuhl's work (1981, 1985, 1986, 1992a, 1992b) includes a substantial amount of experimental data to support a theoretical framework which is broad enough to contain hypotheses about social causes of state/action orientation as well as interventions which may affect this variable. The data reported here suggest this may be an important avenue to explore.

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Appendix A

You will be asked to complete various tasks (problem solving tests and health questionnaires). A small sample of your blood will be drawn before and after the tests. The influence of cognitive functioning (i.e. memorization, addition, word associations) and the conditions under which it is done, on blood chemistry will be examined. If you have any questions about the methods or outcomes of this procedure, contact

Colleen Murphy-Southwick
Psychology Department
University of Montana
Missoula, Montana
phone: 243-6347

This name and number will be provided on a sheet for you to take with you after the testing.

In the event that you are injured as a result of this research you should individually seek appropriate medical treatment. If the injury is cause by the negligence of the University or any or its employees, you may be entitled to reimbursement or compensation pursuant to the Comprehensive State Insurance Plan established by the Department of Administration under the authority of M.C. A., Title 2, Chapter 9. In the event of a claim for such injury, further information may be obtained from the University's Claims Representative or University Legal Counsel.

I agree to have my blood drawn for this research. I understand that my blood will be drawn by a certified phlebotomist with 10 years of experience in sterile blood drawing procedures as a hospital employee. I understand that the only tests that will be run on my blood will be tests of immune functioning.

_____

(Signature)

Appendix B

TESTING PROCEDURE

(Be very formal and official. Answer questions politely but not conversationally and always remind your subjects that their work should be the best they are capable of.)

Tell subject:

I will begin by giving you some tests to perform. We are interested in looking at problem solving abilities and immune function. It is important that you do these tasks as fast and as accurately as you can. This part of the experiment will only last for 30 minutes so work as hard as you can on all of the tests. Your scores will be compared to others who have had their blood tested.

1. Selective Attention Test

Here are 7 cards: you will have 5 minutes to study all the cards - any way you wish. Please memorize the words in the square. We will have you recall the words after we take the cards away in 5 minutes.

(set timer for 5 minutes)

Here is a list of words. Mark the words that you remember from the squares. BUT . . <u>also</u> mark any words that you remember that were in the circles, even though I only told you to memorize the words in the squares. You have 2 minutes.

(set timer for 2 minutes)

2. Remote Association Test

Here is the next test. Read the directions and then begin. If you have any questions before you begin, feel free to ask. You will have 5 minutes.

(set timer for 5 minutes)

3. PASAT (see PASAT administration Guidelines)

4. Stroop Test

(Place a form C sheet in front of them so that it is on a flat surface and say:)

On this page are some words. I would like you to read these words aloud as quickly as you can, starting at the top of this first column. When you finish this column, go to the top of the next column and so on (point to the top of the columns and indicate that the subject should read all the columns in the same manner). Read the words aloud as quickly and as accurately as you can. If you make a mistake, just correct yourself and keep on going. You will have 120 seconds. Ready? Begin.

(set timer for 2 minutes - Record correct responses by making a check mark next to the item, record incorrect responses by entering an X next to the item. If the subject gives an incorrect response and corrects it spontaneously, mark a C next to that item.)

(place a form C-W in front of them so that it is on a flat surface and say:)

Here is a page with more words on it. This time, I would like you to name aloud the color of the ink - red, blue, green, or tan (point to words printed in these colors) - in which the word is printed. Go as quickly as you can, going down the columns just as you did before. For this first one you would say "RED" Understand? if you make a mistake, just correct yourself and keep on going. Name the color of the ink as quickly and as accurately as you can. You will have 120 seconds. Ready? Begin.

(set timer for 2 minutes - Record responses as before)

5. Math Test

Here is a booklet of math problems. Your work will be compared to others for accuracy and speed. You will have 5 minutes.

(set timer for 5 minutes)

(Colleen will try to knock on the door at 30 minutes from when she shut the door and you began the testing to take them for the blood draw. If the timer rings and no one has come - Mark a big line at their last answer and tell them you will now time them to see how long it takes them to finish the booklet.)

(If I have still not come: give them the 7 selective attention cards and tell them that this time they are to memorize both the words in the square and the words in the circle and they will be asked to write them in the recall test, not find them on a list.)

(set timer for 7 minutes)

(While they study them, come and find me and tell me you are into plan C!)

AFTER BLOOD DRAW

(Escort your subject back to your room. Ask them to fill out the rating sheet and then the CHIPS (physical symptoms), PSS (perceived stress), and Illness (open lines to write on) questions. When they have finished read the debriefing to them.)

CONTROL TESTING PROCEDURE

(Be very formal and official. Answer questions politely but not conversationally.)

Tell subject:

You will be given some questionnaires to fill out. In the condition to which you have been assigned, you will have some time to wait between tests. You may study or read or I will bring you some magazines from the waiting room. There is a radio here you may use, do not play it so loud as to disrupt work in the next room. I will be back periodically to check on you. Do you have any questions?

When you are not taking care of you subject from the control condition, you will be responsible for the greeting and escorting of the other subjects being tested at the same time. Colleen will show you the greeting and escorting procedure.

Return to the room in approximately 10 minutes. Knock before entering and ask them if there is anything they need. At 30 to 40 minutes from the time they entered the room (depending on when the drawing room is free), knock on the door and enter. Tell the subject it is time for the second blood test and escort them to the blood drawing room

AFTER SECOND BLOOD DRAW

(Escort your subject back to your room. Now you can act in a less formal and more relaxed way. Ask the subject to fill out the rating sheet and then the CHIPS (physical symptoms), PSS (perceived stress), and Illness (open lines to write on) questions. When they have finished read the debriefing to them.

Appendix C

Debriefing for Control Subjects

This experiment is testing the effects of the pressures of problem solving tasks on immune function. There are differences in the way individuals handle pressures of this kind physically as well as mentally. You were assigned to the control condition, the assignments were made randomly. This means you did not have the problem solving tasks to perform. We need to test the same chemical responses we are measuring in the experimental group in subjects who did not have to perform the tests.

It is very important to the effort you have invested here and the results of this study that you do not talk about this study to other students until after March 11. We are testing many students from the Psychology classes, and any understanding of what is being done here could affect the performance of future subjects.

We thank you for your participation. If you have any questions please feel free to ask you experimenter, or the principle investigator - Colleen Murphy-Southwick.

Debriefing for Experimental Subjects

This experiment is testing the effects of the pressures of problem solving tasks on immune function. There are differences in the way individuals handle pressures of this kind physically as well as mentally. Your performance or scores on these tests are not related to your intelligence or your success in school. These are tests of various specific skills in an artificial situation. Total success in every area is not possible. Also, your scores are not related to your immune status. The chemical responses your body makes to the stressful situation is what is being tested here. Successful performance or right answers do not affect blood chemistry.

It is very important to the effort you have invested here and the results of this study that you do not talk about this study to other students until after March 11. We are testing many students from the Psychology classes, and any understanding of what is being studied could affect the performance of future subjects.

We thank you for your participation. If you have any questions please feel free to ask me, or the principle investigator - Colleen Murphy-Southwick.

Appendix D

If after you leave this experiment you become aware that you still have questions or concerns that were not adequately addressed at the time, you should be aware there are people to whom you can direct these concerns. You are welcome to call the primary investigator, Colleen Murphy-Southwick, or the faculty supervisor for this research, Dr. Frances Hill. If you prefer to seek independent consultation to address your concerns you can contact the Clinical Psychology Center or the Student Health Service of the University of Montana. The phone numbers for these contacts are listed below.

Colleen Murphy-Southwick. 243-6347
Dr. Frances Hill. 243-4821
UofM Clinical Psychology Center . 243-4523
UofM Student Health Service 243-2122

Appendix E

Please answer the following questions by circling one of the two possible choices (A or B) that you feel is most like you. In some cases, you may feel that both answers apply - in that case, choose the one that is the most typical for you, or how you would react most often in that situation.

There are no correct or incorrect answers on this questionnaire. Rather, we are interested in your spontaneous reaction to each question. You should work quickly and not spend too much time thinking about a question; instead, quickly make a decision and mark your answer. If you answer A it does not mean you would never choose B, just that you would most often choose A.

Please answer every question, as skipping questions can invalidate the results of the questionnaire.

1. When I have lost something that is very valuable to me and I can't find it anywhere:
   A. I have a hard time concentrating on something else
   B. I put it out of my mind after a little while

2. When I know I must finish something soon:
   A. I have to push myself to get started
   B. I find it easy to get it done and over with

3. When I have learned a new and interesting game:
   A. I quickly get tired of it and do something else
   B. I can really get into it for a long time

4. If I've worked for weeks on one project and then everything goes completely wrong with the project:
   A. It takes me a long time to adjust myself to it
   B. It bothers me for a while, but then I don't think about it any more

5. When I don't have anything in particular to do and I am getting bored:
   A. I have trouble getting up enough energy to do anything at all
   B. I quickly find something to do

6. When I'm working on something that's important to me:
   A. I still like to do other things in between working on it
   B. I get into it so much that I can work on it for a long time

7. When I'm in a competition and have lost every time:
   A. I can soon put losing out of my mind
   B. The thought that I lost keeps running through my mind

8. When I am getting ready to tackle a difficult problem:
   A. It feels like I am facing a big mountain that I don't think I can climb
   B. I look for a way that the problem can be approached in a suitable manner

9. When I'm watching a really good movie:
   A. I get so involved in the film that I don't even think of doing anything else
   B. I often want to get something else to do while I'm watching the movie

10. If I had just bought a new piece of equipment (for example, a tape deck) and it accidentally fell on the floor and was damaged beyond repair:
   A. I would manage to get over it quickly
   B. It would take me a long time to get over it

11. When I have to solve a difficult problem:
    A. I usually don't have a problem getting started on it
    B. I have trouble sorting out things in my head so that I can get down to working on the problem

12. When I have been busy for a long time doing something interesting (for example, reading a book or working on a project):
    A. I sometimes think about whether what I'm doing is really worthwhile
    B. I usually get so involved in what I'm doing that I never think to ask about whether it's worthwhile

13. If I have to talk to someone about something important and, repeatedly, can't find her/him at home:
    A. I can't stop thinking about it, even while I'm doing something else
    B. I easily forget about it until I can see the person again

14. When I have to make up my mind about what I am going to do when I get some unexpected free time:
    A. I takes me a long time to decide what I should do during this free time
    B. I can usually decide on something to do without having to think it over very much

15. When I read an article in the newspaper that interests me:
    A. I usually remain so interested in the article that I read the entire article
    B. I still often skip to another article before I've finished the first one

16. When I've bought a lot of stuff at a store and realize when I get home that I paid too much --but I can't get my money back:
    A. I can't concentrate on anything else
    B. I easily forget about it

17. When I have work to do at home:
    A. It is often hard for me to get the work done
    B. I usually get it done right away

18. When I'm on vacation and I'm having a good time:
    A. After a while, I really feel like doing something completely different
    B. I don't even think about doing anything else until the end of my vacation

19. When I am told that my work has been completely unsatisfactory:
    A. I don't let it bother me for too long
    B. I feel paralyzed

20. When I have a lot of important things to do and they must all be done soon:
    A. I often don't know where to begin
    B. I find it easy to make a plan and stick with it

21. When one of my co-workers brings up an interesting topic for discussion:
    A. It can easily develop into a long conversation
    B. I soon lose interest and want to go do something else

22. If I'm stuck in traffic and miss an important appointment:
    A. At first, it's difficult for me to start doing anything else at all
    B. I quickly forget about it and do something else

23. When there are two things that I really want to do, but I can't do both of them:
    A. I quickly begin one thing and forget about the other thing I couldn't do
    B. It's not easy for me to put the thing that I couldn't do out of my mind

24. When I am busy working on an interesting project:
    A. I need to take frequent breaks and work on other projects
    B. I can keep working on the same project for a long time

25. When something is very important to me, but I can't seem to get it right:
    A. I gradually lose heart
    B. I just forget about it and go do something else

26. When I have to take care of something important but which is also unpleasant:
    A. I do it and get it over with
    B. It can take a while before I can bring myself to do it

27. When I am having an interesting conversation with someone at a party:
    A. I can talk to him or her the entire evening
    B. I prefer to go do something else after a while

28. When something really gets me down:
    A. I have trouble doing anything at all
    B. I find it easy to distract myself by doing other things

29. When I am facing a big project that has to be done:
    A. I often spend too long thinking about where I should begin
    B. I don't have any problems getting started

30. When it turns out that I am much better at a game than the other players:
    A. I usually feel like doing something else
    B. I really like to keep playing

31. When several things go wrong on the same day:
    A. I usually don't know how to deal with it
    B. I just keep on going as though nothing had happened

32. When I have a boring assignment:
    A. I usually don't have any problem getting through it
    B. I sometimes just can't get moving on it

33. When I read something I find interesting:
    A. I sometimes still want to put the article down and do something else
    B. I will sit and read the article for a long time

34. When I have put all my effort into doing a really good job on something and the whole thing doesn't work out:
    A. I don't have too much difficulty starting something else
    B. I have trouble doing anything else at all

35. When I have an obligation to do something that is boring and uninteresting:
    A. I do it quickly and get it over with
    B. It usually takes a while before I get around to doing it

36. When I am trying to learn something new that I want to learn:
    A. I'll keep at it for a long time
    B. I often feel like I need to take a break and go do something else for awhile

Appendix F

Scoring Key for the ACS-90 (Action Control Scale)

1. B F	19.A F
2. B D	20.B D
3. B P	21.A P
4. B F	22.B F
5. B D	23.A D
6. B P	24.B P
7. A F	25.B F
8. B D	26.A D
9. A P	27.A P
10.A F	28.B F
11.A D	29.B D
12.B P	30.B P
13.B F	31.B F
14.B D	32.A D
15.A P	33.B P
16.B F	34.A F
17.B D	35.A D
18.B P	36.A P

F=AOF Action orientation subsequent to failure vs. preoccupation

D=AOD Prospective and decision-related action orientation vs. hesitation

P=AOP Action orientation during (successful) performance of activities (intrinsic orientation) vs. volatility

Appendix G

Circle the number for each statement that best describes HOW MUCH THAT PROBLEM HAS BOTHERED OR DISTRESSED YOU DURING THE PAST TWO WEEKS INCLUDING TODAY. Mark only one number for each item. At one extreme 0 means that you have not been bothered by the problem. At the other extreme, 4 means that the problem has been an extreme bother.

HOW MUCH WERE YOU BOTHERED BY:

1. Sleep problems (can't fall asleep, or you wake up in the middle of night or early in morning)	0 1 2 3 4
2. Weight change (gain or loss of 5 lbs or more)	0 1 2 3 4
3. Back pain	0 1 2 3 4
4. Constipation	0 1 2 3 4
5. Dizziness	0 1 2 3 4
6. Diarrhea	0 1 2 3 4
7. Faintness	0 1 2 3 4
8. Constant fatigue	0 1 2 3 4
9. Headache	0 1 2 3 4
10. Migraine headache	0 1 2 3 4
11. Nausea and/or vomiting	0 1 2 3 4
12. Acid stomach or indigestion	0 1 2 3 4
13. Stomach pain (e.g., cramps)	0 1 2 3 4
14. Hot or cold spells	0 1 2 3 4
15. Hands trembling	0 1 2 3 4
16. Heart pounding or racing	0 1 2 3 4
17. Poor appetite	0 1 2 3 4

18. Shortness of breath when not exercising or working hard	0 1 2 3 4
19. Numbness or tingling in parts of your body	0 1 2 3 4
20. Felt weak all over	0 1 2 3 4
21. Pains in heart or chest	0 1 2 3 4
22. Feeling low in energy	0 1 2 3 4
23. Stuffy head or nose	0 1 2 3 4
24. Blurred vision	0 1 2 3 4
25. Muscle tension or soreness	0 1 2 3 4
26. Muscle cramps	0 1 2 3 4
27. Severe aches and pains	0 1 2 3 4
28. Acne	0 1 2 3 4
29. Bruises	0 1 2 3 4
30. Nosebleed	0 1 2 3 4
31. Pulled (strained) muscles	0 1 2 3 4
32. Pulled (strained) ligaments	0 1 2 3 4
33. cold or cough	0 1 2 3 4

Appendix H

List all the illnesses you have experienced in the past two weeks:

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Appendix I

The questions on this scale ask you about your feelings and thought during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. For each question circle one of the alternatives.

1. In the past two weeks, how often have you been upset because of something that happened unexpectedly?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

2. In the past two weeks, how often have you felt that you were unable to control the important things in your life?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

3. In the past two weeks, how often have you felt nervous and "stressed"?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

4. In the past two weeks, how often have you dealt successfully with irritating life hassles?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

5. In the past two weeks, how often have you felt that you were effectively coping with important changes that were occurring in your life?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

6. In the past two weeks, how often have you felt confident about your ability to handle your personal problems?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

7. In the past two weeks, how often have you felt that things were going your way?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

8. In the past two weeks, how often have you found that you could not cope with all the things that you had to do?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

9. In the past two weeks, how often have you been able to control irritations in your life?
   0. never
   1. almost never
   2. sometimes
   3. fairly often
   4. very often

10. In the past two weeks, how often have you felt that you were on top of things?
    0. never
    1. almost never
    2. sometimes
    3. fairly often
    4. very often

11. In the past two weeks, how often have you been angered because of things that happened that were outside of your control?
    0. never
    1. almost never
    2. sometimes
    3. fairly often
    4. very often

12. In the past two weeks, how often have you found yourself thinking about things that you have to accomplish?
    0. never
    1. almost never
    2. sometimes
    3. fairly often
    4. very often

13. In the past two weeks, how often have you been able to control the way you spend your time?
    0. never
    1. almost never
    2. sometimes
    3. fairly often
    4. very often

14. In the past two weeks, how often have you felt difficulties were piling up so high that you could not overcome them?
    0. never
    1. almost never
    2. sometimes
    3. fairly often
    4. very often

Appendix J

SELECTIVE ATTENTION TEST WORDS

airforce	abstract
ankle	accent
interest	lower
pallet	amplify
pursue	angry
phantom	translucent
doing	according
us	barber
certificate	strength
nose	micron
advance	airplane
above	connect
jingle	Africa
accident	salt
yoga	abandon
absurd	absent
knot	trill
aquarium	choke
counter	teach
tung	section
rash	Australia
imitation	lawn

RECALL TEST WORD LIST

vaccine	airforce	angry	jingle
ankle	pig	accident	pass
meter	after	hang	imitation
mass	parallel	abstract	foot
hinge	couch	accent	die
interest	tool	lower	drive
pallet	screw	amplify	transport
incense	gear	translucent	silk
pursue	assault	trill	passion
phantom	flatter	later	pad
brim	check	according	hair
doing	dice	barber	furnish
us	nag	strength	forward
certificate	sit	micron	chess
lawn	myself	rain	airplane
genius	nose	connect	caps
advance	teach	Africa	hour
yoga	section	salt	zoo
Australia	electric	abandon	verge
knot	aquarium	absent	choke
fly	counter	true	advised
tung	take	maroon	milk
croak	rash	cut	bring
above	absurd	garbage	fruit

Appendix K

The following 20 items consist of three words followed by a blank space. Please write in the blank space a word that is related to each of the three words given in the item. For example:

MOWER ATOMIC FOREIGN _____

The correct answer to this item is power. Do not spend more than 1 or 2 minutes on any one item, as any additional time will not likely produce an answer.

1. DOG	CAT	HORSE	_____
2. SUPER	PUNCH	SERVING	_____
3. BIG	SMALL	TINY	_____
4. INDIAN	ARCTIC	ATLANTIC	_____
5. FIRST	SECOND	THIRD	_____
6. MOTOR	SPORTS	POLICE	_____
7. TEPEE	CABIN	BOAT	_____
8. HAM	CHILI	CHEESE	_____
9. BIRD	CHOIR	TEA POT	_____
10. MALTA	CYPRUS	CAPRI	_____
11. STOUT	BITTER	ALE	_____
12. PHILIP	ANDREW	CHARLES	_____
13. LARIAT	LASSO	REATA	_____
14. TREBLE	BASE	GRAND	_____
15. COTTAGE	SWISS	BLUE	_____
16. QUARTER	HALF	WHOLE	_____
17. SILVER	YELLOW	WEDDING	_____
18. FOOT	GOLF	POWER	_____
19. SING	SCREAM	CHANT	_____
20. POCKET	JACK	STEAK	_____

Appendix L

Please complete the following math problems. You will not be allowed to use a calculator. This task is a test of basic cognitive-processing capabilities. Your performance will be assessed as a function of both speed and accuracy. At the end of the session, your cognitive processing abilities will be compared to those of others who have performed the computations.

1. 2 - 3 + 1 =
2. 5 x 7 - 54 =
3. 5 + 9 x 0 =
4. 1 - 8 + 3 =
5. 7 x 2 - 5 =
6. 9 + 93 - 76 =
7. 24 + 97 x 0 =
8. 8 - 86 + 95 =
9. 23 x 3 - 6 =
10. 74 + 4 x 4 =
11. 55 - 4 + 5 =
12. 5 x 5 - 43 =
13. 10 + 53 x 7 =
14. 4 - 3 + 5 =
15. 8 - 9 + 0 =
16. 61 x 1 - 83 =
17. 74 + 4 - 10 =
18. 96 + 2 - 21 =
19. 34 + 31 - 4 =
20. 87 - 16 + 35 =
21. 32 x 4 - 43 =
22. 6 + 22 - 35 =
23. 0 + 0 x 5 =
24. 10 - 32 + 21 =
25. 15 - 43 + 8 =
26. 83 - 43 + 8 =
27. 97 - 67 + 4 =
28. 85 - 19 + 4 =
29. 51 - 7 + 5 =
30. 85 x 3 - 78 =
31. 80 + 5 - 90 =
32. 1 - 9 + 43 =
33. 2 x 42 - 87 =

34. 1 ÷ 69 - 5 =
35. 97 - 31 ÷ 2 =
36. 61 x 7 - 1 =
37. 8 x 9 - 9 =
38. 7 ÷ 55 - 3 =
39. 87 ÷ 0 - 94 =
40. 25 - 12 ÷ 5 =
41. 84 x 1 - 54 =
42. 88 ÷ 21 - 51 =
43. 3 ÷ 1 x 17 =
44. 4 - 33 ÷ 6 =
45. 42 x 6 - 93 =
46. 38 x 1 - 44 =
47. 33 ÷ 9 - 30 =
48. 8 ÷ 7 x 2 =
49. 32 - 79 ÷ 7 =
50. 33 x 1 - 18 =

Note. The math problems listed above were printed in a booklet with only four problems to a page to allow room to write calculations when necessary.

Appendix M

Name:_____

Psyc 100 Instructor:_____

Experimenter:_____

SELECTIVE ATTENTION MEMORY TASK (words in circles & squares):

	not at all						very
Stressful	1	2	3	4	5	6	7

REMOTE ASSOCIATES TEST (three words with blank line):

	not at all						very
Stressful	1	2	3	4	5	6	7

STROOP TEST (color names in different colors):

	not at all						very
Stressful	1	2	3	4	5	6	7

PASAT (taped recording of numbers):

	not at all						very
Stressful	1	2	3	4	5	6	7

MATHEMATICAL PROBLEM-SOLVING TASK (pages of math problems):

	not at all						very
Stressful	1	2	3	4	5	6	7

THE BLOOD DRAWING PROCEDURE:

	not at all						very
Stressful	1	2	3	4	5	6	7

Name:_____

Psyc 100 Instructor:_____

Experimenter:_____

THE BLOOD DRAWING PROCEDURE:

	not at all						very
Stressful	1	2	3	4	5	6	7

Appendix N

The following questionnaire will ask you to answer questions about your health. You may fill out this questionnaire on your own, or you may have the interviewer read the questions to you. If you choose to have the questions read to you, you may either circle your answers on your copy after the questions are read, or you may have the interviewer mark the answers as you answer them out loud. Your answers will be kept in strict confidence. Your name will be separated from your questionnaire and no one will know how you answered the questions.

1. Name _____

2. Birth date: Month_____Day_____Year_____

3. Age _____
   # of years

4. You are
   1. male 2. female

5. Are you currently
   1. married
   2. separated
   3. divorced
   4. widowed
   5. never married

Appendix O

RUCHL

Instruction for RUCHL

The experiences on the RUCHL were obtained from personal interviews with a large number of people, therefore some items will not be relevant to you. Please, only respond to the experiences or thought that you have had in the past two months.

In the interviews, people reported four kinds of experiences. I am calling them routines, hassles, challenges, and uplifts. I will define each kind and give you some examples.

Routines: These occur so regularly and with such little effort that you hardly have to think about them.

Examples: Taking a shower; preparing breakfast.

Since no two people have exactly the same lifestyle or take part in exactly the same daily activities you may not agree that taking a shower or preparing breakfast are routines. You may refer to categorize them as uplifts, challenges, or hassles.

Uplifts: These experiences or thoughts make you feel good and give you peace, satisfaction, or joy.

Examples: Taking a shower, receiving a gift.

If you are a caregiver and wait until you have a free moment, you may view it more as an uplift than a routine.

Challenges: Challenges are demanding, sometimes difficult to carry out, but are accompanied by self-satisfaction or personal gain.

Examples: Resolving a conflict with a friend; preparing breakfast.

If you have a busy schedule but you like to prepare a good breakfast for your family, you may view preparing breakfast as a challenge rather than a routine or uplift.

Hassles: These are experiences that are irritating, frustrating, and/or distressing. In general, these are taxing and undesirable experiences that you would not seek out but which are imposed by circumstances.

Examples: Unreliable car; preparing breakfast.

If preparing breakfast is a strain because you have to prepare several different menus or because you know the food will not be appreciated, you may view preparing breakfast as a hassle rather than a routine or challenge.

The list contains a wide variety of experiences that can be pleasant and positive, unpleasant and negative, or even a mixture of both. Therefore, I am asking you to rate the impact of each experience: to circle how positive and how negative the impact of each item was on you.

Some items are written to describe experiences and others are written to describe your thought. Thus read each item carefully. Remember, respond only to those items that reflect you activities of thought for the past two months.

It is important to realize that each person thinks about any experience differently from someone else. Thus, there is no such thing as right or wrong answers. We are interested in how each of you identifies and rates the items on the list. To make sure that you understand how to proceed, we will work thorough 4 examples. Then you can work at your own pace.

Let us work through the four examples given to you.

1. Select an item.

a. Look at the first item on the list. Circle it if you have experienced it in the past two months, including today.

b. If you have not experienced it, do not circle it, and move on to the next item.

2. Put the item into a category.

a. When you have come to an item you have experienced, decide into which category listed to the right of the item it best falls.

b. These categories are Routines, Uplifts, Challenges, and Hassles.

Routine experiences are ones that occur regularly, that you hardly have to think about, and that take very little effort.

Uplifts are experiences or thoughts that generally make you feel good and give you peace, satisfaction, or joy.

Challenges are experiences or thoughts that are difficult to carry out but that are accompanied by some self satisfaction or personal gain.

Hassles are experiences or thoughts that generally are irritating, frustrating, or distressing.

c. If more than one category applies, pick the best one.

d. Circle the letter corresponding to the category.

Categorizing each experience is an individual matter. For example, depending upon your life circumstances, taking a morning shower could be a routine, uplift, challenge, or hassle.

Also remember to categorize these experiences as they were for you in the last two months, not usually, not next week, but in the last two months.

3. Impact ratings: Any experience or thought may affect you in a positive way, in a negative way, both positively and negatively, or neither positively nor negatively.

4. Rate the time's positive impact.

a. The positive impact scale is to the right of the category list.

b. This scale asks only whether the experience affected you in a positive way, had a positive impact on you, or made you feel good.

c. The positive impact scale includes.

0 = No positive effect
1 = Slightly positive effect
2 = Somewhat positive effect
3 = Very positive effect
4 = Extremely positive effect

d. Circle the number that best indicates the degree of positive impact the experience had or is having on you.

5. Rate the item's negative impact.

a. The negative impact scale is to the right of the category list.

b. This scales asks only whether the experience affected you in a negative way, had a negative impact on you, or made you feel bad.

c. The negative impact scale includes.

0 = No negative effect
1 = Slightly negative effect
2 = Somewhat negative effect
3 = Very negative effect
4 = Extremely negative effect

d. Circle the number that best indicates the degree of negative impact the experience had or is having on you.

6. Continue through the list.

a. Circle the item if you are experiencing it or if you have experience it in the past two months.

b. Circle the category into which the experience best fits.

c. Circle the number that best represents the item's positive impact.

d. Circle the number that best represents the item's negative impact.

EXAMPLE RUCHL

Type
R = Routine
U = Uplift
C = Challenge
H = Hassle

Impact Ratings

0	1	2	3	4
Not at all	Slightly	Somewhat	Very	Extremely

Experience	Type	Positive Impact	Negative Impact
1. Prepare dinner.	R U C H	0 1 2 3 4	0 1 2 3 4
2. Attend a meeting.	R U C H	0 1 2 3 4	0 1 2 3 4
3. Have a friend phone to see how I feel.	R U C H	0 1 2 3 4	0 1 2 3 4
4. Think about my decreasing contact with friends.	R U C H	0 1 2 3 4	0 1 2 3 4

Type
R = Routine
U = Uplift
C = Challenge
H = Hassle

Impact Ratings

0	1	2	3	4
Not at all	Slightly	Somewhat	Very	Extremely

Experience	Type	Positive Impact	Negative Impact
1. Clean the house and/or do the laundry.	R U C H	0 1 2 3 4	0 1 2 3 4
2. Plan a vacation.	R U C H	0 1 2 3 4	0 1 2 3 4
3. Visit people in their homes.	R U C H	0 1 2 3 4	0 1 2 3 4
4. Unable to visit people in their homes.	R U C H	0 1 2 3 4	0 1 2 3 4
5. Attend a social function.	R U C H	0 1 2 3 4	0 1 2 3 4
6. Unable to attend a social function.	R U C H	0 1 2 3 4	0 1 2 3 4
7. Have friendship and companionship from spouse.	R U C H	0 1 2 3 4	0 1 2 3 4
8. Think about not having friendship and companionship from spouse.	R U C H	0 1 2 3 4	0 1 2 3 4
9. Read books or magazines.	R U C H	0 1 2 3 4	0 1 2 3 4
10. Unable to read books or magazines.	R U C H	0 1 2 3 4	0 1 2 3 4
11. Have privacy.	R U C H	0 1 2 3 4	0 1 2 3 4
12. Rarely have privacy.	R U C H	0 1 2 3 4	0 1 2 3 4
13. Personal grooming.	R U C H	0 1 2 3 4	0 1 2 3 4
14. Efforts to help spouse get or stay healthy.	R U C H	0 1 2 3 4	0 1 2 3 4

15. Deal with chronic or brief illness of spouse or other household member (e.g. common cold, heart disease, injury).	R U C H	0 1 2 3 4	0 1 2 3 4
16. Complete a specific task.	R U C H	0 1 2 3 4	0 1 2 3 4
17. Too many interruptions.	R U C H	0 1 2 3 4	0 1 2 3 4
18. Go to the library.	R U C H	0 1 2 3 4	0 1 2 3 4
19. Prepare and eat meals at home.	R U C H	0 1 2 3 4	0 1 2 3 4
20. Eat out with a friend.	R U C H	0 1 2 3 4	0 1 2 3 4
21. Eat out with my spouse.	R U C H	0 1 2 3 4	0 1 2 3 4
22. Have legal matters and responsibilities to manage.	R U C H	0 1 2 3 4	0 1 2 3 4
23. Volunteer, civic, or church/synagogue work.	R U C H	0 1 2 3 4	0 1 2 3 4
24. Think about my decreasing commitments outside my home.	R U C H	0 1 2 3 4	0 1 2 3 4
25. Read the newspaper.	R U C H	0 1 2 3 4	0 1 2 3 4
26. Have too much spare time.	R U C H	0 1 2 3 4	0 1 2 3 4
27. Have too little time for myself.	R U C H	0 1 2 3 4	0 1 2 3 4
28. Shop for clothes for myself.	R U C H	0 1 2 3 4	0 1 2 3 4
29. Have repairs done to my home.	R U C H	0 1 2 3 4	0 1 2 3 4
30. Meditation and prayer.	R U C H	0 1 2 3 4	0 1 2 3 4
31. Receive phone calls or letters from friends or relatives.	R U C H	0 1 2 3 4	0 1 2 3 4

32. Have someone visit me in my home.	R U C H	0 1 2 3 4	0 1 2 3 4
33. Exercise regularly.	R U C H	0 1 2 3 4	0 1 2 3 4
34. Think about not getting regular exercise.	R U C H	0 1 2 3 4	0 1 2 3 4
35. Can't find something important.	R U C H	0 1 2 3 4	0 1 2 3 4
36. Find something important.	R U C H	0 1 2 3 4	0 1 2 3 4
37. Deal with a personal chronic illness.	R U C H	0 1 2 3 4	0 1 2 3 4
38. Watch TV or listen to the radio.	R U C H	0 1 2 3 4	0 1 2 3 4
39. Write checks to pay bills.	R U C H	0 1 2 3 4	0 1 2 3 4
40. Sufficient funds to pay bills.	R U C H	0 1 2 3 4	0 1 2 3 4
41. Yardwork.	R U C H	0 1 2 3 4	0 1 2 3 4
42. Feeling of loneliness.	R U C H	0 1 2 3 4	0 1 2 3 4
43. Arranging transportation for myself, spouse, or child(ren).	R U C H	0 1 2 3 4	0 1 2 3 4
44. Being home much of the day.	R U C H	0 1 2 3 4	0 1 2 3 4
45. Engage in my hobbies and/or special or professional interests.	R U C H	0 1 2 3 4	0 1 2 3 4
46. Think about not engaging in my hobbies or special interests.	R U C H	0 1 2 3 4	0 1 2 3 4
47. Time outdoors.	R U C H	0 1 2 3 4	0 1 2 3 4
48. Recreation.	R U C H	0 1 2 3 4	0 1 2 3 4

49. Think about not being able to spend time in recreational activities.	R U C H	0 1 2 3 4	0 1 2 3 4
50. Travel with spouse.	R U C H	0 1 2 3 4	0 1 2 3 4
51. Grocery shopping.	R U C H	0 1 2 3 4	0 1 2 3 4
52. Sleeping.	R U C H	0 1 2 3 4	0 1 2 3 4
53. Have car repaired or have problems with my car.	R U C H	0 1 2 3 4	0 1 2 3 4
54. Interaction with my child(ren).	R U C H	0 1 2 3 4	0 1 2 3 4
55. Provide help to people outside my home.	R U C H	0 1 2 3 4	0 1 2 3 4
56. Time to relax.	R U C H	0 1 2 3 4	0 1 2 3 4
57. No time to relax.	R U C H	0 1 2 3 4	0 1 2 3 4
58. Think about children's lifestyles and accomplishments.	R U C H	0 1 2 3 4	0 1 2 3 4
59. Think about my grandchild(ren).	R U C H	0 1 2 3 4	0 1 2 3 4
60. Think about my investments.	R U C H	0 1 2 3 4	0 1 2 3 4
61. Think about who will care for me when I am unable to care for myself.	R U C H	0 1 2 3 4	0 1 2 3 4
62. Think about the appearance of the inside of my home.	R U C H	0 1 2 3 4	0 1 2 3 4
63. Think about placing my spouse in a nursing home.	R U C H	0 1 2 3 4	0 1 2 3 4
64. Think about my weight or physical appearance.	R U C H	0 1 2 3 4	0 1 2 3 4
65. Think about pleasant past events.	R U C H	0 1 2 3 4	0 1 2 3 4

66. Think about how past decisions have turned out for the better.	R U C H	0 1 2 3 4	0 1 2 3 4
67. Make an important decision.	R U C H	0 1 2 3 4	0 1 2 3 4
68. Think about my responsibilities.	R U C H	0 1 2 3 4	0 1 2 3 4
69. Have a relative (other than spouse) help me get through a difficult situation.	R U C H	0 1 2 3 4	0 1 2 3 4
70. Think about my responsibilities.	R U C H	0 1 2 3 4	0 1 2 3 4
71. Think about events in the news.	R U C H	0 1 2 3 4	0 1 2 3 4
72. Think about my relationships with neighbors and/or friends.	R U C H	0 1 2 3 4	0 1 2 3 4
73. Think about relationship(s) with my child(ren).	R U C H	0 1 2 3 4	0 1 2 3 4
74. Think about my overall health.	R U C H	0 1 2 3 4	0 1 2 3 4
75. Think about the degree of love and affection I receive.	R U C H	0 1 2 3 4	0 1 2 3 4
76. Think about my sexual relationships.	R U C H	0 1 2 3 4	0 1 2 3 4
77. Attend support group meetings.	R U C H	0 1 2 3 4	0 1 2 3 4
78. Confide in friend or relative for comfort, understanding, or advice.	R U C H	0 1 2 3 4	0 1 2 3 4

79. Confide in my spouse for comfort, advice, or understanding.	R U C H	0 1 2 3 4	0 1 2 3 4
80. Think about not being able to confide in my spouse.	R U C H	0 1 2 3 4	0 1 2 3 4
81. Think about personal safety.	R U C H	0 1 2 3 4	0 1 2 3 4

Did I miss any meaningful experiences that happened to you this past month? If I did, please, list, categorize and rate them below.

82.	R U C H	0 1 2 3 4	0 1 2 3 4
83.	R U C H	0 1 2 3 4	0 1 2 3 4
84.	R U C H	0 1 2 3 4	0 1 2 3 4
85.	R U C H	0 1 2 3 4	0 1 2 3 4
86.	R U C H	0 1 2 3 4	0 1 2 3 4

Note. The RUCHL questionnaire given to the subjects in Experiment 2 was printed in large type with the heading found on page 106 at the top of every page.

Appendix P

1. Have you been sick in bed for at least four consecutive days in the last year?
1. yes 2. no

2. Have you been sick in bed for at least four consecutive days in the last two weeks?
1. yes 2. no

3. Have you been hospitalized in the last year?
1. yes 2. no

4. Have you been hospitalized in the last two weeks?
1. yes 2. no

5. Have you seen a physician in the last year about a health problem (i.e., for other than routine exams)?
1. yes 2. no

6. Have you seen a physician in the last two weeks about a health problem (i.e., for other than routine exams)?
1. yes 2. no

7. How many prescription drugs are you currently taking?
1. more than five 2. two, three, four, or five 3. one 4. none

8. Do you suffer from pain?
1. a lot 2. some 3. none

9. Do you have difficulty moving around?
1. a great deal 2. some 3. none

10. Do you depend on others for performing activities of daily living such as eating, bathing, dressing, grooming, and walking across the room?
1. totally dependent on others 2. need some help 3. need no help

11. Are you limited on activities because of your health?
1. severely limited 2. somewhat limited 3. not limited

12. Have you had a sudden change in health?
1. yes 2. no

12a. If yes, when was this sudden change?

12b. What was this change?

13. Your health is
1. poor 2. fair 3. good 4. excellent

Note. All the questionnaires given to the subjects in Experiment 2 were printed in large type and formatted with narrow margins. This health questionnaire appeared on one page.